Terrestrial and Amphibious Monitoring Plan for the CALFED Bay-Delta Program

WORKSHOP SUMMARIES For Summer, 2000

1. "Habitats of estuarine tidal and diked wetlands of the Delta, Suisun Marsh and North San Francisco Bay"
August 30, 2000

2. "Habitats of freshwater and riparian wetlands of the Central Valley"
September 7, 2000

3. "Ecological processes and biological communities across the CALFED landscape"
September 14, 2000

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ACKNOWLEDGEMENTS

We wish to gratefully acknowledge Dave Ceppos of Jones and Stokes Associates for his excellent job in helping us prepare for the workshops and then facilitating the workshops. We also wish to thank Peter Stine for providing his considerable vision and leadership on the TAMP development team and to wish him well with his new job working on the Sierra Nevada program with the U.S. Forest Service. We also thank Larry Smith and Marty Kie for addressing the workshops, members of the TAMP Internal Review Team for all their assistance and insightful comments, and finally all the workshop participants for sharing their valuable time and expertise**.** We also wish to thank Jones and Stokes Associates for allowing us to use their facilities for two of the three workshops.

OVERVIEW OF ALL THREE WORKSHOPS

Three workshops were held to evaluate and refine elements of CALFED's Terrestrial and Amphibious Monitoring Plan (TAMP). Forty-five people participated in one or more of the three workshops

1) "Tidal Wetlands Workshop": Habitats of estuarine tidal and diked wetlands of the Delta, Suisun Marsh and North San Francisco Bay…….....Aug. 30, 2000

2) "Freshwater & Riparian Wetlands Workshop": Habitats of freshwater and riparian wetlands of the Central Valley……..…..Sept. 7, 2000

3) "Landscape Workshop": Ecological processes and biological communities across the CALFED landscape……..……Sept. 14, 2000

Participants at the first two workshops reviewed materials and offered comments prior to the workshop. These comments were used to identify areas for discussion at the workshop. The third workshop did not involve a pre-workshop review and the agenda was considerably looser in format than the first two workshops.

Overall, workshop participants seemed to feel that a lot of good work had been assembled in the review materials. Participants gave comments on general issues as well as comments on specific monitoring elements in the review materials. The general discussion issues follow. Several issues came up at more than one workshop. The detailed pre-workshop and workshop comments are given in the workshop summaries. The workshops were not able to discuss all issues raised during the pre-workshop review and participants recommended follow up with specific workshop members.

- Participants felt that clearer definitions of some of the terminology were needed, e.g., "indicator", "patch", "status and trends monitoring", and "baseline." Some participants felt that what defines "habitat quality" depends on the specific species involved.
- The "***P****ressure-****S****tate of Environment-****A****ctions-****E****ffects*" framework created some confusion because monitoring elements would appear multiple times in the tables when they were needed to provide information to answer multiple questions. In addition, some monitoring elements should not have been placed under independent attribute headings since they were really used as covariates for interpreting other monitoring results. The monitoring recommendations listed for the CALFED actions were sometimes confusing and the rationales needed expansion. Workshop participants requested improvement in the clarity of the presentation of the monitoring recommendations. In future reports, the information should be presented in two different ways: 1) by monitoring element, and 2) by the PSAE framework.
- The group also recommended that clear conceptual models be articulated, along with more detailed rationales for the monitoring recommendations
- The temporal scales and frequency of monitoring should be included.
- Participants raised questions about how CALFED would relate to existing programs and how TAMP would be integrated with the aquatic monitoring plan.
- Participants discussed the different ways an efficient monitoring program could be developed, e.g., by using a network of intensive and extensive monitoring sites similar to the CPIF program, or by taking advantage of monitoring for MSCS species

when it allows gathering of additional community information at little additional cost. Although using habitat monitoring as a surrogate for species monitoring is another way of cutting costs, there are only a limited number of good species-habitat models. Many more would need to be developed.

- Participants wanted to know how monitoring elements would be prioritized. Concern was also raised that monitoring elements would be eliminated prematurely from the plan if they were covered by existing programs or were considered too expensive. [*Currently the TAMP development team expects the plan to include recommendations for monitoring information in existing programs as well as new monitoring*].
- The Landscape Workshop (third workshop) concluded with a discussion on what should be the highest priority monitoring issues for inclusion in an implementable TAMP and developed the following list:
  - Physical Landscape changes
    (Including both general changes and changes attributed to CALFED actions)
  - Land use changes
  - Vegetation cover and type changes
    (Including both general changes and changes attributed to CALFED actions)
  - Status of MSCS species ('R' and 'r' first)
  - Monitor assemblages of species to improve understanding and assessment of habitat values
  - Ecosystem processes and function
  - Status and trends of non-indigenous species and contaminants
  - Status and trends of other pressures

  The group couldn't prioritize further than this without more knowledge about what existing programs are already covering, greater detail in the monitoring elements, and a general idea of what the projected budget would be.

DESCRIPTION OF THE WORKSHOP PROCESS

Introduction to TAMP

The draft Terrestrial and Amphibious Monitoring Plan (TAMP) report identifies biological and physical elements of the terrestrial environment that should be monitored as part of a baseline monitoring program for CALFED's Ecosystem Restoration Program (ERP) and provide information in an adaptive management context. TAMP addresses monitoring recommendations for terrestrial and wetland habitats, the geomorphic and hydrologic processes that support them, and the plants, mammals, birds, reptiles, amphibians, and terrestrial invertebrates that reside within those habitats.

The TAMP objectives are:

1) assess status and trends in the valued terrestrial and amphibious resources of the ecosystem as defined by the goals and objectives of the ERP, and
2) assess the cumulative effects of ERP actions against the background of anthropogenic pressures and natural variation

Purpose of the workshops

An initial preliminary draft TAMP report was developed in May, 2000. This draft contained a large set of recommended monitoring elements which required some initial review from technical experts prior to obtaining broader review. Figure 1 gives an overview of how review is occurring in TAMP.

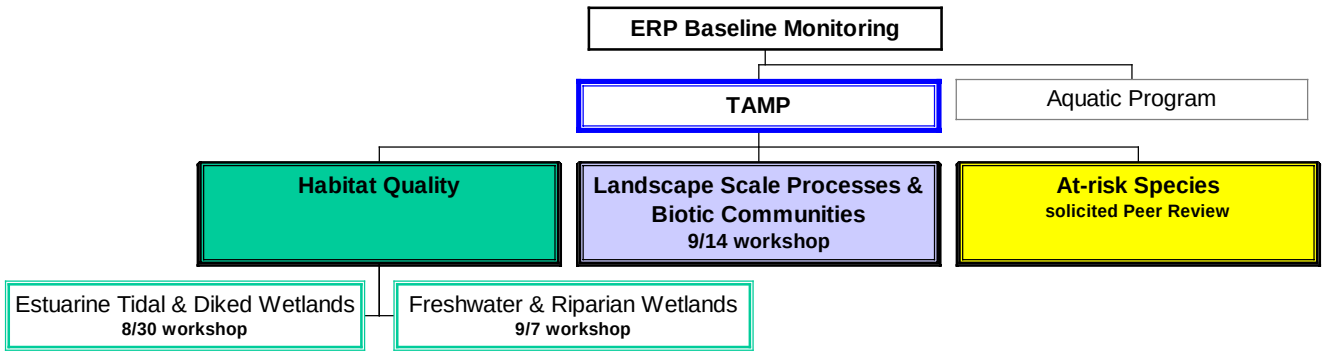
Three workshops were held in late summer of 2000 as a means to obtain some technical review and improve the landscape and habitat quality monitoring recommendations in TAMP. Review of the at-risk species monitoring recommendations would occur separately through solicited peer-review. The three workshops were

<u>Workshops</u>

1) "Tidal Wetlands Workshop": Habitats of estuarine tidal and diked wetlands of the Delta, Suisun Marsh and North San Francisco Bay…….....Aug. 30, 2000
2) "Freshwater & Riparian Wetlands Workshop": Habitats of freshwater and riparian wetlands of the Central Valley……..…..Sept. 7, 2000
3) "Landscape Workshop": Ecological processes and biological communities across the CALFED landscape……..……Sept. 14, 2000

The objectives of the TAMP workshops were to:
1) **Evaluate** the recommended monitoring elements in TAMP. Are the recommended elements ***necessary*** and ***sufficient*** to inform managers on the status and trends of the valued terrestrial resources defined by the ERP goals and objectives?
2) **Review** the list of existing monitoring programs at the workshop and provide information on other programs that have not yet been identified.

Figure 1. Organization of the TAMP Monitoring Recommendations for the purpose of technical review



The review of the monitoring recommendations focused primarily on "what" should be monitored and "why" and only secondarily on the “how” (i.e. utilizing GIS, a network of extensive and intensive sites, etc.). The identified monitoring elements were chosen based upon relevance to ERP goals and objectives and ability to assist management decision-making.

Workshop process

Prospective workshop participants were identified by the TAMP development team and the TAMP internal review team, a group of approximately 20 people from various federal and state agencies and a few non-profit stakeholder groups. The purpose was not to create an exhaustive list of all interested parties, but instead to gather together sufficient expertise to review the monitoring recommendations and move them to a point where a wider level of review would be both possible and fruitful.

Workshop participants in the first two workshops were asked to provide a quick preliminary review of the monitoring recommendations prior to the workshop by identifying those monitoring elements that should be modified or rejected and by providing written comments. The results of these preliminary reviews were compiled and used to identify discussion points for the 1-day workshops. The third workshop (landscape) did not include this pre-workshop review. All three workshops discussed both broad issues as well as specific monitoring recommendations. However the broad issues discussed varied among the workshops. Due to a lack of time, not all issues identified in the preliminary review could be discussed at the workshops. Some follow-up with individual participants was conducted to gain additional reviews on these issues.

Comments received from the preliminary review, during the workshops, and immediately following the workshops are included in the workshop reviews.

Purpose of this document
This document attempts to summarize the comments received at the three workshops in such a way that it is accessible to both workshop participants and non-participants alike.

Description of the workshop summaries
Each workshop summary include an overview of the key points made at the workshop, general comments that were made, tables of the monitoring elements with the comments received during the workshop plus comments received before and immediately after the workshop. The authors' names have been detached from the comments in the tables. The monitoring elements themselves are presented unchanged from when they were presented in the workshops.

The Tidal Wetlands workshop and the Freshwater and Riparian Wetlands workshops have been broken into three tables (TW1, TW2, TW3, and FR1, FR2, and FR3):
1) Habitat maintenance and sustainability due to physical and ecological processes
2) Habitat extent & connectivity.
3) Habitat quality in support of native biodiversity, including MSCS species

Habitat quality was further sub-divided into
-> broad attribute categories
-> attributes of state of environment, pressures, and ERP actions
-> local and regional monitoring elements

The monitoring elements in the Landscape workshop are contained in a single table, broken into Ecological Processes, Habitats, and Biota.

Figure 2 describes the layout and codes contained within the Tables.

The attributes in each table are numbered separately, "Typed" according to the P-S-A-E framework described in the background section and provided with a brief rationale. Monitoring elements associated with the attributes are identified for both the "Patch/Local site" as well as the "Regional" scale. The number of people recommending "accepting (A)", "modifying (M)", or "excluding (E)" each monitoring element in the pre-workshop review are recorded. Specific comments given either before, during, or immediately after the workshop are included.

Many reviewers only focused their comments on those sections of the table where they felt they had the most expertise. Thus different people responded to different portions of the tables. Although the number of people who recommended "Accepting", "Modifying", or "Excluding" various monitoring elements is given, we do not consider this a popularity contest. The recommendations to modify and/or exclude are taken very seriously, even if made by only one person.

Figure 2. Explanation for Tables. Describes layout for Tables TW1,TW2, TW3, FR1, FR2, FR3, L1. The layout follows the format of the Review Forms used at the workshops with new columns added for comments. In some places "New" attributes were recommended by reviewers and these were included. Table L1 did not have a pre-workshop review or patch/local scale monitoring recommendations so those columns have been removed.

Two Scales: * Regional level scale: monitoring recommended for assessing status and trends at a regional level
* Patch/local site scale: monitoring recommended for assessing status and trends at a local level

General Wetland Attribute Category and references to ERP Strategic Objectives (see Appendix A)

Attribute Reference Number "New" means participants recommended adding this attribute.

TABLE TW1. SUMMARY OF COMMENTS - Tidal Wetland Maintenance and Sustainability due to Physical & Ecological Processes

No.	State, Pressure or Action Attribute	Rationale	Patch / Local Scale: Monitoring Element	Patch / Local Scale: Evaluation	Regional level: Monitoring Element	Regional level: Evaluation	Pre- and Post- Workshop Comments	Comments during workshop
WETLAND HYDROLOGY & SALINITY (ERP Strategic Objective 2.1)								
1.1	STATE: Area of wetlands receiving tidal inundation	What is the extent of wetlands open to tidal inundation? Large areas of tidal wetlands have been diked and converted to other land uses or management.	wetted perimeter - shoreline of perimetter corresponding to high water datum (19)	A-7 M-1	wetted area	A-6 M-1	* It seems reasonable to include depth classes relative to the high water datum. Restoring tidal action to heavily subsided areas will likely result in excessive water depths	The spatial extent and frequency of mapping needs to be resolved There is a whole range of conditions ranging from diked to muted tidal to undiked that are important. The diked/undiked distinction is not clearcut. Wetted perimeter is a different issue and does not really belong here. It is more useful for birds. Wetted area should be used at both regional and local levels. The extent of wetted area depends on when it is measured. It could simply be calculated from the topography and water depth The issue of high water datum needs to be resolved
1.5	PRESSURE: Diking of wetlands	What is the extent of tidal wetlands now diked?	Degree of patch tidal inundation inhibited due to human causes: full, muted or none	A-6 E-2	extent of wetlands classified by degree of tidal inundation: full, muted, or none	A-7 E-1	* this seems to be a more regional question	
1.12	ACTION: Restore tidal flows to diked wetlands by breaching dikes in suitable areas	restore tidal flows to diked wetlands by breaching dikes in suitable areas (7)			Extent, location, & status of diked wetlands & muted wetlands re-opened to tidal influence	A-7 M-1	* unnecessary: Use classification scheme tidal, muted, etc.	

PSAE Attributes
State of Environment: attributes of the environment relating to the general wetland attribute category
Pressure: Anthropogenic pressure negatively affecting the "State" attributes
Pressure-Redirected: Redirected effects of pressures resulting from other CALFED program actions
Pressure-Natural: or source of variation such as sea level rise
Action: CALFED ERP Action

Rationale for monitoring elements
Gives brief rationale for monitoring elements selected

Recommended Monitoring Element
NOTE: If in italics, it has been included previously in the table for another reason

Pre-Workshop Evaluation scores
No. participants recommending
A: Accept
M: Modify
E: Exclude
for monitoring element to left

Pre- and Post-Workshop Comments
Comments received either before or after the workshop. Comments from different people are separated by "*"

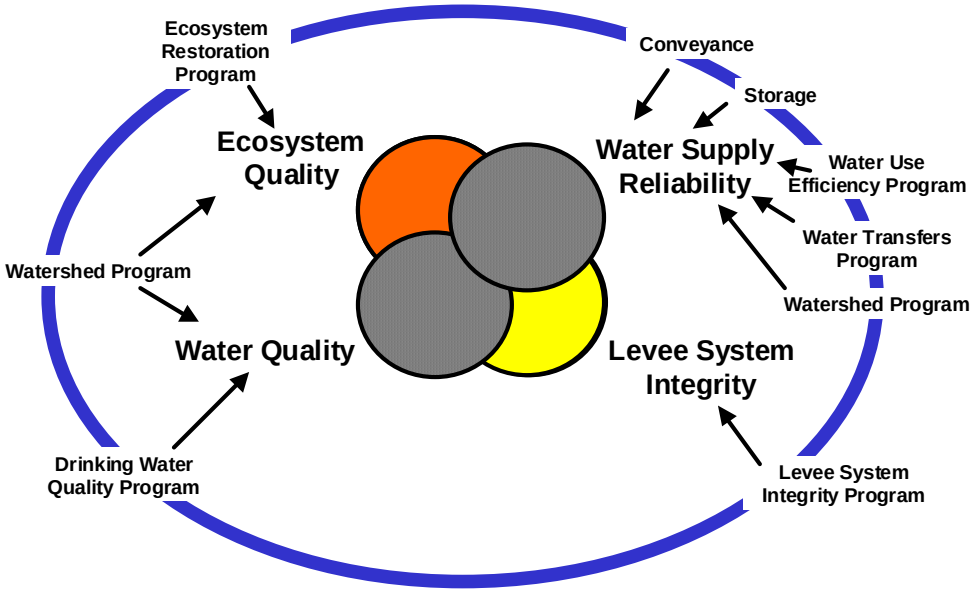
Comments during Workshop

BACKGROUND

What is CALFED?

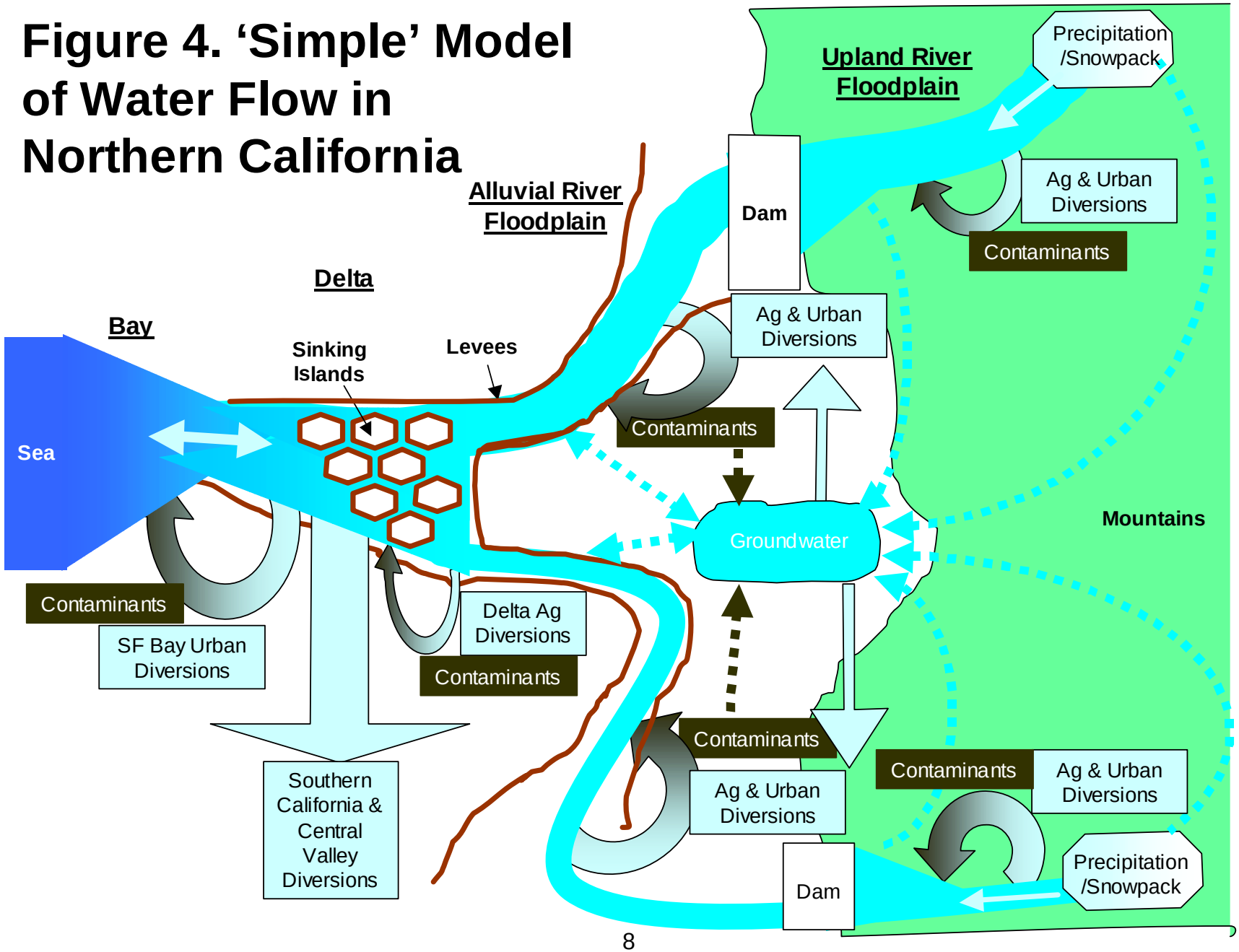
The CALFED San Francisco Bay-Delta Program is a cooperative effort of federal and state agencies and stakeholder groups in California initiated in 1994 "**to develop a long-term comprehensive plan that will restore ecosystem health and improve water management for beneficial uses of the Bay-Delta System."** The CALFED Bay-Delta Program has four inter-related critical resource problem areas -- ecosystem health, water supply reliability, drinking water quality, and levee system integrity – and is one of the largest and most complex multiple-objective resource management programs in the world. Figure 3 shows the four CALFED problem areas and the relationship of the various CALFED programs to these problem areas. Progress in any one problem area must be made without significant redirected effects on another problem area.

Figure 3. Four CALFED Critical Resource Problem Areas and the CALFED Programs that address them



The driving factor behind CALFED is improving water management for beneficial uses. Past water management strategies have had unintended consequences on the ecosystem: dams on nearly every tributary separate rivers from their headwaters, levees restrict natural river meander processes and cut off habitats, changes in the amount, timing, and temperatures of river flows affect both habitats and species, and water diversions both large and small change flow patterns and cause direct mortality to aquatic species (see Figure 4). These changes have strongly impacted the aquatic

Figure 4. 'Simple' Model of Water Flow in Northern California



environment but have also severely disrupted the natural hydrologic and geomorphic processes that support terrestrial environments as well. With a rapidly growing human population in California, there is enormous pressure to find a better balance between preserving and restoring the environment and reliably supplying and managing water to support the people of California.

Additional information on CALFED can be found on the web at:
http://www.calfed.water.ca.gov/environmental_docs.html

What is the ERP?

CALFED's Ecosystem Restoration Program (ERP) addresses the problem of declines in ecosystem health through six goals (summarized in the box below; described in detail in Appendix A).

CALFED's ERP goals can be briefly summarized as follows: (For the full text of the CALFED Goals see Appendix A)

1) Achieve recovery of at-risk native species...
2) Rehabilitate natural processes...
3) Maintain and/or enhance… selected species for... harvest...
4) Protect and/or restore functional habitat types...
5) Prevent establishment of...and reduce...impacts of…non-native species...
6) Improve and/or maintain water and sediment quality...

Means and actions to achieve these goals include increasing the amount and quality of habitats, improving ecological processes, minimizing identified stressors, protecting species, and establishing populations in new locations.

CALFED monitoring needs and TAMP

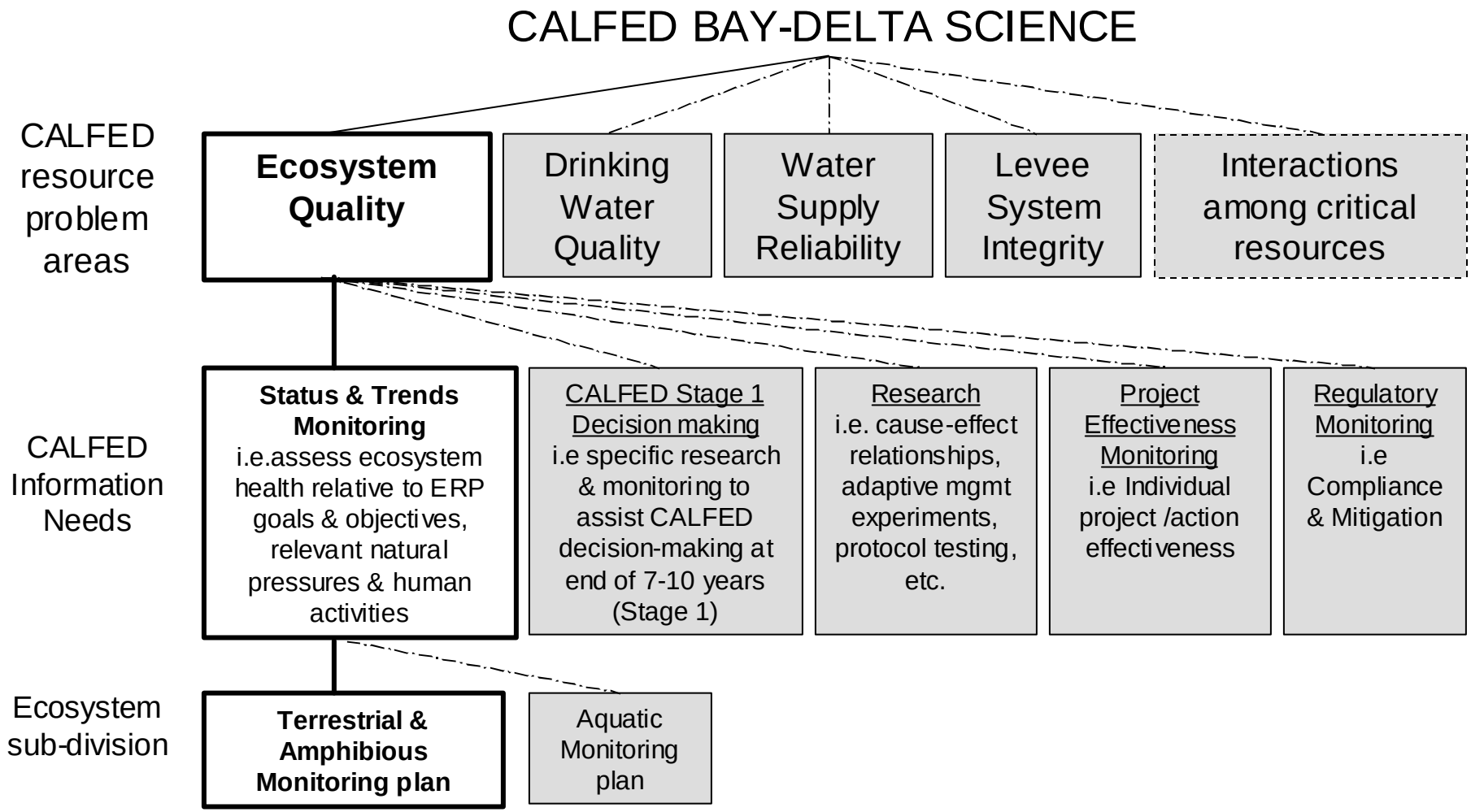
TAMP addresses only part of the overall monitoring needs of CALFED and of the ERP (see Figure 5). The purpose of TAMP is to define the fundamental biological and physical elements of the terrestrial environment within CALFED's geographical area, (see Figure 6 map) that should be monitored as part of a baseline program. These elements will provide information necessary to evaluate progress towards the goals of the ERP, evaluate status and trends in the ecosystem, and evaluate status and trends of species identified by the Multi-Species Conservation Strategy. TAMP does not include project-specific monitoring.

Why have the terrestrial and aquatic monitoring plans been separated?

TAMP addresses monitoring recommendations for terrestrial and wetland habitats, the geomorphic and hydrologic processes that support them, and the plants, mammals, birds, reptiles, amphibians, and terrestrial invertebrates that reside within those habitats. A separate effort is developing the baseline aquatic monitoring plan for fish, aquatic invertebrates, shallow water habitats and the processes that support them. Although dividing the ecosystem into "terrestrial" and "aquatic" components may seem awkward, separate but complementary efforts were believed more effective given the differences in the dominant pressures (habitat loss for terrestrial, water management and diversions

Figure 5. Relationship of Terrestrial & Amphibious Monitoring to Science Needs for Entire CALFED Bay-Delta Program

(Unshaded areas are addressed by TAMP)



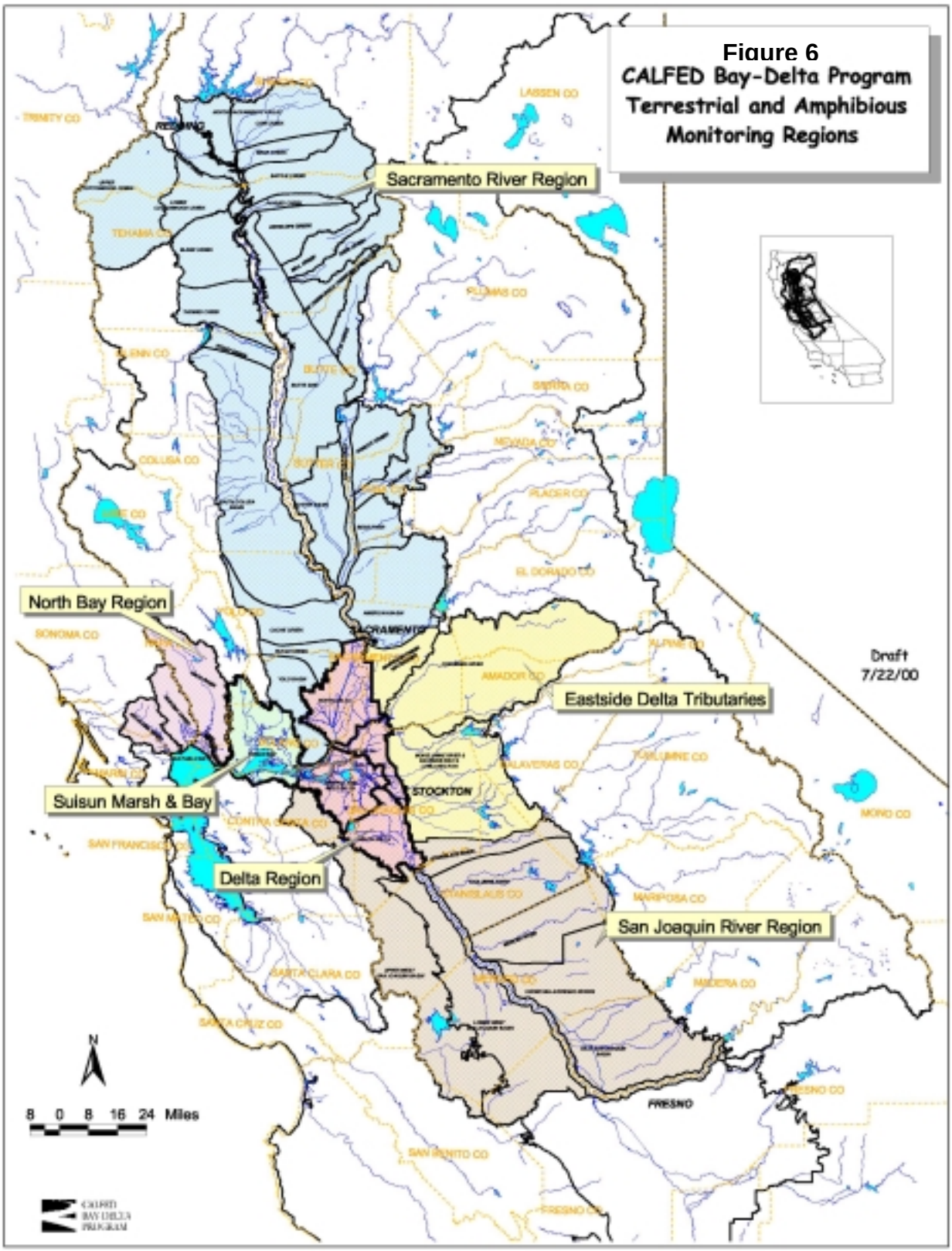


Figure 6
CALFED Bay-Delta Program
Terrestrial and Amphibious
Monitoring Regions
Sacramento River Region
North Bay Region
Suisun Marsh & Bay
Delta Region
Eastside Delta Tributaries
San Joaquin River Region
Draft
7/22/00
8 0 8 16 24 Miles
N

for aquatic) and the differences in the level of existing monitoring efforts between the aquatic and terrestrial components.

Development of TAMP monitoring recommendations
The design process is outlined in Figure 7. This basic sequence, in one form or other, has been used in ecosystem management programs elsewhere in the United States. Each of these tasks may have additional sub-tasks including iterative cycles of review and refinement but ultimately they lead towards on-the-ground implementation of data collection and analysis. The design of a baseline monitoring program for CALFED will also attempt to build as much as possible upon the large number of existing monitoring and research activities.

Our current process, continues the substantial efforts of CALFED's Comprehensive Monitoring Assessment and Research Program (CMARP) and incorporates recommendations from numerous prior efforts and existing documents as shown in Figure 8.

TAMP Organizing Framework
The TAMP organizing framework consists of a geographical hierarchy, the general categories of monitoring, and the Pressure-State-Actions-Effects framework.

Geographical Organization of TAMP
The geographical organization for TAMP can generally be summarized as follows:

Landscape wide
- 6 Regions *(changing to 4 in future)*
  - 14 ERP Ecological Management Zones
    - 52 ERP Ecological Management Units
      - Local site/ patch

See figure 6 for a map of the regions*. [Please note that this hierarchy will be changing in future versions of TAMP to correspond with the regions used in the CALFED Record of Decision (2000). Delta and Eastside Delta Tributaries will be combined into one region. Suisun Bay and Marsh and North San Francisco Bay will be combined into one region.]*

Geographical Regions (with corresponding CALFED ERP Ecological Management Zones or Unit)
1) **Delta** (Sacramento-San Joaquin Delta)
2) **Suisun Bay and Marsh** (Suisun Bay & Marsh Ecological Management Unit)
3) **Sacramento River Basin** (Sacramento River, North Sacramento Valley, Cottonwood Creek, Colusa Basin, Butte Basin, Feather River/Sutter Basin, American River Basin, Yolo Basin)
4) **San Joaquin River Basin** (San Joaquin River, East San Joaquin Basin, West San Joaquin Basin)
5) **North San Francisco Bay** (North San Francisco Bay and regions upstream of Suisun Bay)
6) **Eastside Delta Tributaries** (Eastside Delta Tributaries).

Figure 7. Design Process for Terrestrial and Amphibious Monitoring Plan (TAMP)

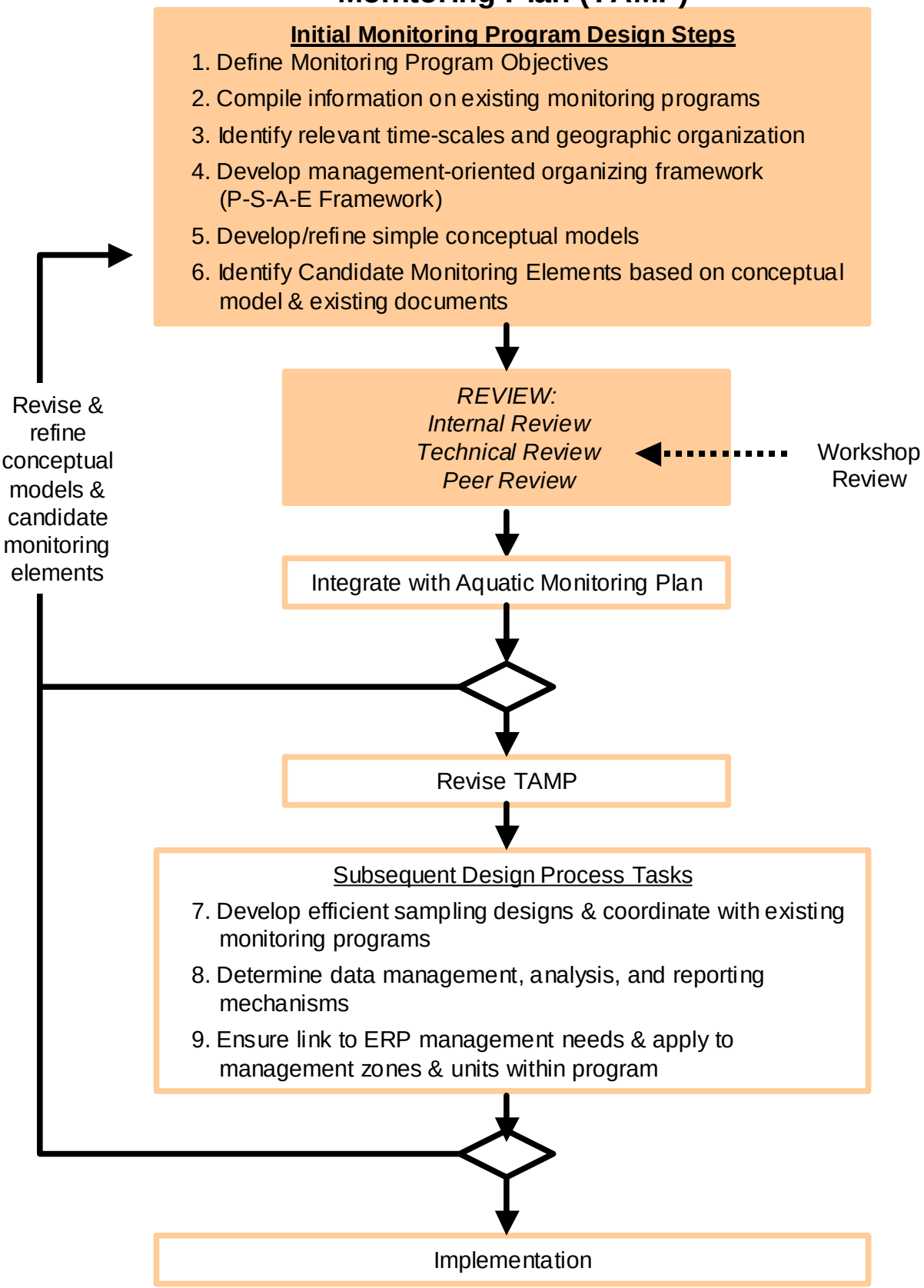
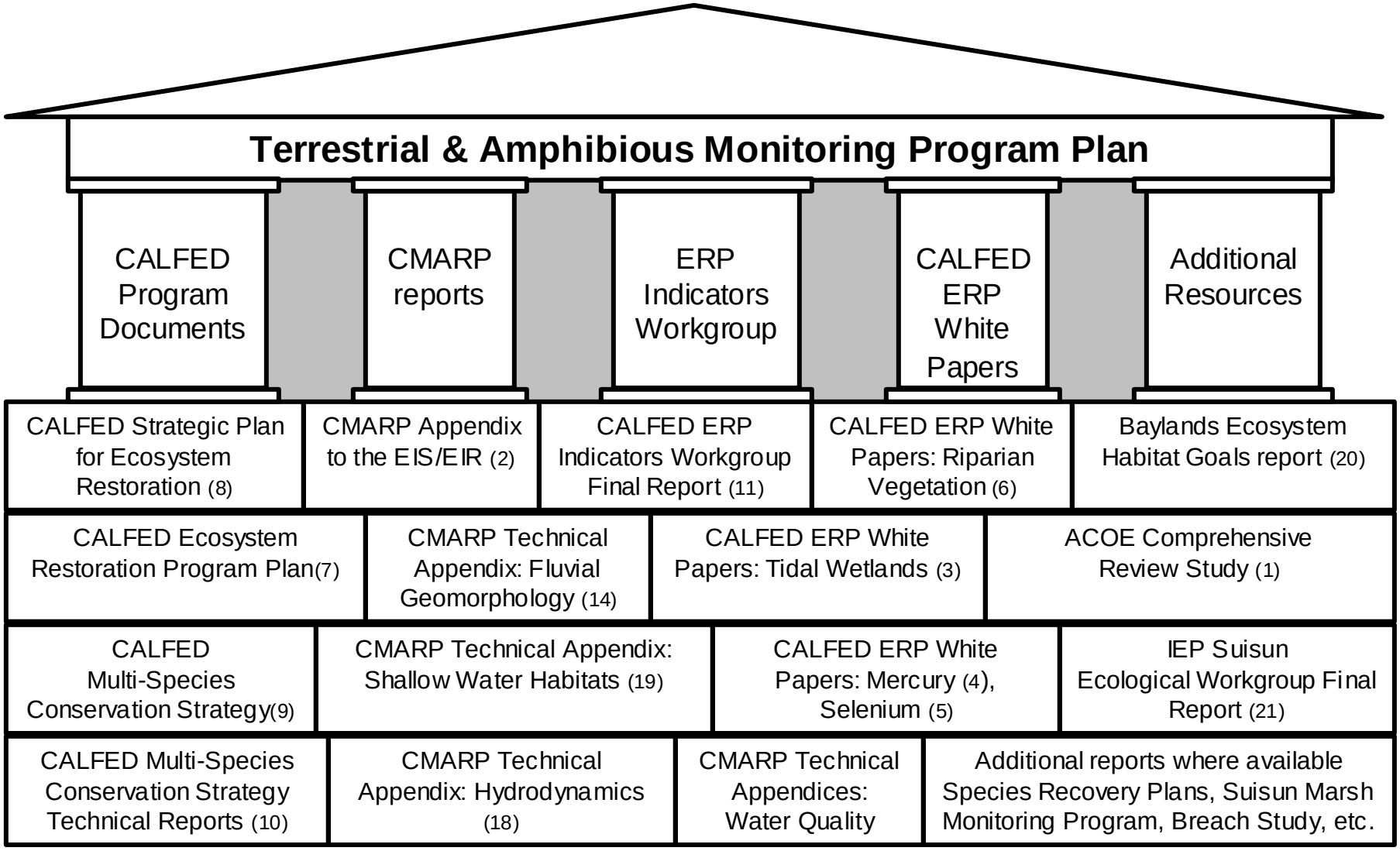


Figure 8. Terrestrial & Amphibious Monitoring Program Plan is Built on the Strong Foundation of Previous Efforts

Numbers in parentheses () are the reference numbers for these documents used in the tables.



General Categories of Monitoring

TAMP divided the status and trends monitoring into three categories. Monitoring ***Targeted At-risk Species and Biological communities*** focuses on the status of species of concern identified by the ERP and MSCS. Monitoring for ***Habitat Quality*** assesses the state of specific habitat types relative to their sustainability and ability to support native species and communities. ***Landscape Monitoring*** addresses the status of ecological processes, pressures, biological communities, and the extent and distribution of the mosaic of habitats across the landscape. These three categories result in some overlap. However, TAMP is addressing monitoring from all three perspectives, since no one of these perspectives would ensure that monitoring would meet all of CALFED's needs.

What is habitat quality?

The ERP has the following strategic goals

> *"Goal 2: Ecological Processes: Rehabilitate natural processes in the Bay-Delta estuary to fully support, with minimal ongoing human intervention, natural aquatic and associated terrestrial biotic communities and habitats, in was that favor native members of those communities."*
>
> *Goal 4 Habitats: Protect and/or restore functional habitat types in the Bay-Delta estuary and its watershed for ecological and public values such as supporting species and biotic communities, ecological processes, recreation, scientific research, and aesthetics.*

Since habitats must be sustained by natural processes and "functional" in supporting native biotic communities (i.e. appropriate structural and compositional elements and natural levels of pressures), we have broadly defined habitat quality as
1) the maintenance and sustainability of natural habitats relative to ecological processes
2) support of native biodiversity.

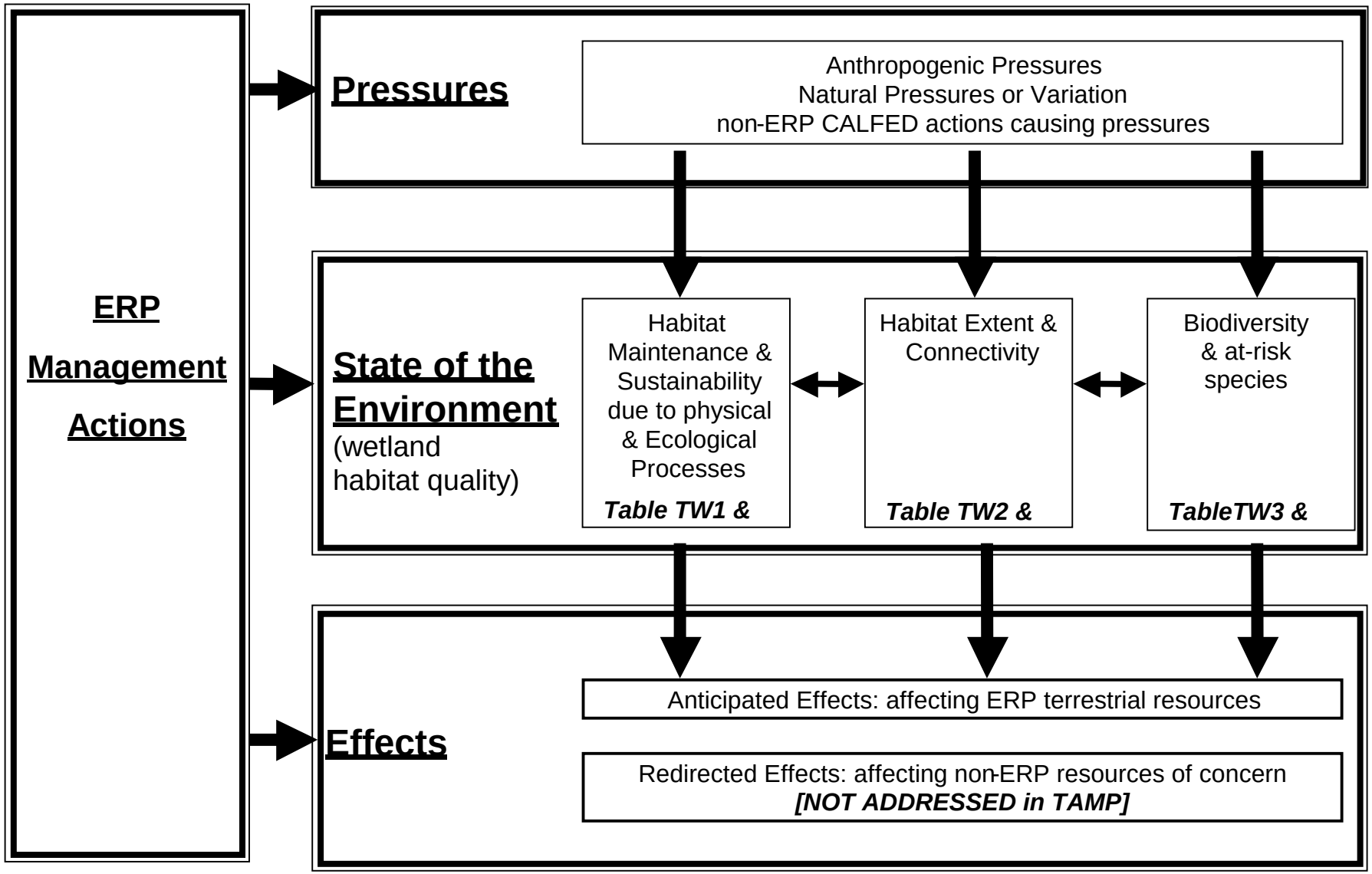
For convenience during the workshops, we added a third category
3) habitat extent & connectivity.

> Monitoring required for ERP at-risk species and biological communities may overlap with monitoring elements identified for habitat quality although the questions monitoring data is used to answer may be different.

P-S-A-E Conceptual framework

The process for identification of the terrestrial baseline monitoring elements is based on the "***P****ressure-****S****tate-management* ***A****ctions-****E****ffects*" conceptual framework depicted in Figure 9 (derived from the more traditional pressure-state-response" framework used in other ecosystem management programs). This framework helps to clarify the relationship between management actions and the state of valued components in the system (that managers are trying to affect) and thus helps to identify the important elements of a baseline monitoring program.

Figure 9. Selection of Attributes and Monitoring Elements is based on Pressure-State-Action-Effects (P-S-A-E) conceptual model



State of the Environment includes important *ecological processes, habitats,* and *species*, as identified by the ERP. *Pressures* include anthropogenic stressors identified by the ERP (e.g., levees, dredging, invasive riparian and salt marsh plants, contaminants, non-native wildlife), and factors which are identified indirectly in the ERP (e.g., urbanization, habitat loss, alterations to managed salinity) and natural disturbances or variability. *Management actions* are those taken by the ERP, which are expected to impact the *State of the Environment* and/or *Pressures*.

CALFED has four problem areas with the potential to impact one another (see Figure 3). Therefore, *Effects* in the framework includes both the expected *Effects* of ERP actions on ecosystem components as well as *Redirected effects* on other problem areas addressed by CALFED's other programs. *Effects* of ERP actions could include monitoring the benefits of large-scale restoration of wetland habitat in the Delta as well as potential negative effects on erosion rates and sustainability of existing marshes supporting ERP species of concern. Although not directly addressed in TAMP, *Redirected effects* may include uncertainties such as the effects of large-scale wetland construction in the Delta on levels of organic carbon in drinking water or water loss through transpiration—both important concerns to other CALFED programs. Although *Management Actions* of other CALFED programs, such as levee system integrity, can affect Ecosystem quality, these recommendations are addressed generally in TAMP and will need to be refined as more specific actions are identified. ***Recommendations in TAMP address anticipated cumulative effects of actions not project-specific monitoring.***

The generic questions for status (and trends over time) that the monitoring elements address are:

- What is the status of attributes within the *state of the environment*?
- What is the status of *Pressures* (especially those that are the basis for Actions)?
- What is the status of implementation of *Management Actions*?
- What are the *effects* on Attributes of cumulative Management Actions?

As specific CALFED actions are identified, monitoring will need to be identified to address *Redirected effects* for both ERP actions on other CALFED programs as well as other CALFED program actions on ERP resources.

Next steps

Considerable work remains. The next steps in the TAMP design process include technical review by species experts for recommendations to monitor at-risk species identified in the ERP, revisions and review of the draft TAMP report, and creation of an implementable program for the highest priority issues in TAMP. Currently the monitoring recommendations are largely in the form of **"what"** should be monitored and **"why".** Agreement on what are the highest priorities for development is needed. The specifics of **"how"** to monitor each element must be detailed –i.e. where, when, how, how often. Coordination with existing monitoring programs and development of a data management, assessment, and reporting process need to be developed.

Concern also was raised at the workshop that monitoring elements would be eliminated prematurely from the plan if they were covered by existing programs or were considered too expensive. Currently we expect the plan to include recommendations for monitoring information in existing programs as well as new monitoring. The initial task is to determine what is “necessary” and “sufficient” to provide information to managers. Not all monitoring recommendations will be implemented initially, but it is important to have all information needs clearly identified.

WORKSHOP 1
Habitats of estuarine tidal and diked wetlands of the Delta, Suisun Marsh and North San Francisco Bay (Aug. 30, 2000)

WORKSHOP OVERVIEW

Overall, workshop participants felt that a lot of good work had been assembled in the review materials. However, there were some areas of confusion, particularly over the presentation of the recommendations. Participants felt that clearer definitions of some of the terminology were needed, e.g., “indicator”, “patch”, “status and trends monitoring”, and “baseline.” The PSAE framework also created confusion because monitoring elements would appear multiple times in the tables when they were needed to provide information to answer multiple questions. In addition, some monitoring elements that were under separate headings represented covariates for interpreting other monitoring results rather than separate monitoring recommendations themselves. The monitoring recommendations listed for the CALFED actions were sometimes confusing and the rationales needed expansion. Workshop participants requested improvement in the clarity of the presentation of the monitoring recommendations. Presentation both within the PSAE framework and by monitoring element was suggested.

The group also recommended a clear conceptual model be articulated, along with more detailed rationales for the monitoring recommendations, and pointed out that the temporal scales and frequency of monitoring really must be included for evaluation.

Table TW1

The workshop discussion on table TW1 centered on refining the section on “Wetland Hydrology and Salinity” section and did not get to the rest of the sections on channels, erosion, accretion, etc. In general, more detail, clarity, and refinement was requested. Also participants recommended using the actual salinity data rather than the existing indicator “X2” and expanding monitoring to include lateral salinity gradients as well as the longitudinal salinity gradient along the main axis of the estuary and researching the relationship between these gradients to changes in the salinity levels within the marshes.

Table TW2

Overall there was general acceptance of table TW2 with a few comments during the workshop about monitoring land use changes and how to define “corridor”. Some elements need clearer wording or may be difficult to monitor as stated.

Table TW3

There was considerable discussion of table TW3 with many specific recommendations for improving monitoring elements were given. Concerns were raised about how CALFED will choose to manage tidal and diked wetlands because there are tradeoffs between optimum management for different species. Optimum management for MSCS at-risk species may have negative impacts on shorebirds and waterfowl. In addition to

monitoring species targeted by the ERP, monitoring of predators and prey for targeted species should also be considered. Predators can include native as well as non-indigenous predators.

WORKSHOP 1 DETAILS– GENERAL DISCUSSION

1) Redundancy

Many participants commented that the information presented in the Pressure-State-Action-Effects (PSAE) framework contained many redundancies that contributed to confusion in the review.

TAMP staff responded that they realized the PSAE framework created redundancies and that they would try to clarify the presentation in the future. They also stated that they would present the information in the next version of the report in 2 different ways 1) by monitoring element and 2) by PSAE framework. It was hoped that the PSAE framework helped clarify the purpose of each individual monitoring element. However often the same monitoring element is used for multiple purposes.

2) No Temporal scales

There is no sense of temporal scale given in these monitoring elements. This needs to be added. The frequency of the monitoring and the purpose of the assessment techniques must be clarified.

The Wetland Regional Monitoring Program (being assembled by the San Francisco Estuary Institute) has discussed the issue of temporal scales and came up with the following scales:

Natural trends (long-term) – i.e. long term climate change
Interannual variability
Seasonality
Oceanographic events that are non-cyclical
Storm events
Noise

3) Definition of Baseline

The issue of how “baseline” should be defined was discussed at length. It was pointed out that this term is often used for different reasons

1) to define where we are coming from and going back to in a historical context, i.e. historical environment (1850)
2) to define where we are coming from operationally, i.e. CALFED Record Of Decision (ROD) or CALFED initiation in 1994
3) to define where we are going to, i.e. CALFED targets.

However, it was decided that the definition of baseline is a political/policy related issue and really couldn’t be resolved at this workshop.

4) Everyone to receive copies of comments
The workshop participants agreed that all participants would receive copies of the comments and copies of the workshop participants emails.

5) Terminology Needs Definition
The workshop participants agreed that many of the terms needed definition or clearer definitions. They suggested putting an interpretation chapter into the report.

Some specific terms that needed work

- Status and Trends

Status is a snapshot in time whereas trends refers to change and the direction of that change

- Indicator
  The term "indicator" is defined differently in different documents

- Patch vs. regional scale
  Participants really had trouble with this term. "Patch" means something different depending on the organism involved.
  Does patch mean "homogenous ecological unit"? local scale? a random sampling site? a reference site? a control site? a project site? species-based definition? habitat based definition?

  The issue of spatial scales requires greater definition, since there are several scales between "regional" and "patch". The RWMP uses estuarine, miny estuary, tidal slough, perpendicular to slough.

  1) semantic definition must be resolved
  2) the spatial extent must be clarified, esp. relative to the definition
  3) the definition/criteria of spatial scales must allow for a statistically valid sampling regime, including allowing correlation analysis of different monitoring elements across different scales.

6) Actions on a separate form?
The "Actions" need better rationales and descriptions. The differences between the "actions" and other "State" and "pressure" variables is unclear. Perhaps the evaluation of actions should be in a 4th separate form. The discussion of "Controls" should be included.

TABLE TW1. SUMMARY OF COMMENTS - Tidal Wetland Maintenance and Sustainability due to Physical & Ecological Processes

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GENERAL COMMENTS								
* I was surprised to find that I am largely in agreement with the program, except in a few areas, and for those it was hard to give the comment I wanted to in the space provided. * I feel that my best input can be provided with the Review Form 1 : Physical Processes. I have attached my review of this form, which includes a few comments. I have reviewed form 2, and agree with all of the elements on this * Perhaps a little more distinction should be made between status monitoring, and trends monitoring. Much of the trends monitoring will occur as part of project effectiveness monitoring and regulatory monitoring. Other trends monitoring will need to be initiated to understand and track natural pressures. What is most important at this time is establishing the monitoring elements necessary to understand our status -- the baseline of ecosystem condition. Then we must sort between elements currently being monitored, and those for which monitoring programs must be established. This must be done as promptly as we can because our actions are already changing the system. * A related issue is our baseline. Some of the review materials mention baseline but do not define it. The definition will affect our approach to monitoring. If the baseline is 2000 our task is easier (document what exists now). But there are strong arguments for a baseline of 1995 (that's when we initiated the CALFED effort, and began to identify our problems; also, our restoration actions began in 1997, so we have moved off of our baseline). A baseline of 1995, of course, requires that we engage in some backcasting or reconstruction of what existed at that time, or rely on (incomplete) monitoring that was carried out at that time. * How or when is monitoring in diked wetlands, particularly in the brackish and saline areas of the Suisun Marsh and San Pablo Bay to be addressed * Overall, need to add more actual monitoring and less simple mapping * Practicality of the monitoring will depend on patch definition. Too many patches will make this economically difficult to include in the monitoring program. You may want to limit this to a selected set of "representative" patches and project specific patches. * A lot of this seems to fall into one task, "GIS mapping of …" * The majority of the monitoring elements seem reasonable and I believe several are already in effect, and I believe several are already in effect and thus I would accept them in the * There are temporal scales of variability that affect marsh parameters, and that should therefore be taken into account when designing sampling regimes: I forgot to include the spring-neap and tropic (lunar declination) tide cycles (about 14 days each), and the lunar day and solar day cycles (25 and 24 hours, respectively).							
WETLAND HYDROLOGY & SALINITY (ERP Strategic Objective 2.1)								
1.1	STATE: Area of wetlands receiving tidal inundation	What is the extent of wetlands open to tidal inundation? Large areas of tidal wetlands have been diked and converted to other land uses or management.	*wetted perimeter - shoreline of perimetter corresponding to high water datum (19)*	A-7 M-1	*wetted area*	A-8 M-1	* It seems reasonable to include depth classes relative to the high water datum. Restoring tidal action to heavily subsided areas will likely result in excessive water depths	The spatial extent and frequency of mapping needs to be resolved There is a whole range of conditions ranging from diked to muted tidal to undiked that are important. The diked/undiked distinction is not clearcut. Wetted perimeter is a different issue and does not really belong here. It is more useful for birds. Wetted area should be used at both regional and local levels. The extent of wetted area depends on when it is measured. It could simply be calculated from the topography and water depth. The issue of high water datum needs to be resolved.
1.2	STATE: Salinity gradient in estuary	What are the status and trends in the salinity gradient in the estuary? Water management has greatly changed the salinity gradient length and variability over the historical record. In addition sea level is rising which will also affect the salinity gradient which in turn affects			*Yearly hydrography compared with historical hydrograph*	A-6 M-1 E-1	* under rationale --expect climatic changes in annual streamflow hydrographs (shift from runoff events and snowmelt to more runoff events and less snowmelt --> more salinity intrusion during dry period of year * There may be significant controversy attempting to characterize the historic hydrograph unless it's limited to the last 50 years or so.	X2 is an interpretation based on sampling stations along the longitudinal axis of the estuary. For TAMP purposes it is better to track the salinity at the individual stations rather than the position of X2. However, there is uncertainty about relating what happens with the salinity gradient along this longitudinal axis with what happens to salinity laterally from this axis and what happens to salinity in shallow

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1.2 Cont.		the composition of vegetation communities throughout the region.			*Water year, especially drought years*	**A-5 M-1 E-2**	* The Water Year classification scheme may not serve tidal wetland monitoring very well. Measurements of the timing, duration, and magnitude of outflow and channel water salinities would be useful regardless of the water year type. * wet years can be as important as dry years in effecting vegetation.	water habitats. We really need to know what is happening to salinity 1) along the longitudinal axis of the estuary 2) at the mouths of each of the rivers 3) laterally from the axis 4) marsh by marsh It was pointed out that vertical mixing and the vertical gradient can also be important and may even be affecting the distribution vegetation. Mason's lilaeopsis may be a good indicator species for changes in salinity. The vegetation element should be considered for removal. A side comment was made that USGS measures salinity every 15 minutes whereas NOAA measures salinity every 6 minutes. Is it possible to get them to coordinate?
			Salinity measures in patch	**A-7 E-1**	X2 - range, variability, seasonality	**A-5 M-1**	* UNCERTAIN WHAT IT MEANS * Measure of X2? * X2 may not meet the needs for assessing tidal wetland maintenance. Consider a more sophisticated measure that can provide the needed information for the Bay and for larger channels in the Suisun Marsh and Delta. * X2 wil be an important element of aquatic monitoring * salinity gradient can vary on a local scale as well as regional level.	
			Type of vegetation reflecting habitat salinity	**A-8**	Changes in vegetation reflecting changes in salinity gradient	**A-6 M-1**	* depends on level of detail -- indicator species needed * this is affected by both wet and dry years.	
1.3	STATE: Wetland hydroperiod, tidal regime, & tidal prism	What are the status and trends in tidal prism in tidal wetlands? Wetland hydrology is an important cofactor for understanding the distribution and location of vegetation communities and species habitats. Tidal prism is an indicator of maintenance of tidal wetland integrity.			*Yearly hydrography compared with historical hydrograph*	**A-7 E-1**	* Add local tributary inflows (Napa river, etc.)? And groundwater discharges?	What is listed is insufficient. Wetland hydrology is much more complicated. Recommend attending Tidal Datums workshop. Hydroperiod must be measured within a patch. Need frequency, depth, duration of inundation, variability, and area. Consider the relationship of area, frequency, duration, and extent of inundation. Although topography is a key monitoring element, it is not sufficient to interpret hydrography. Topography must be captured at high precision. Water level should be measured at various points within the marsh. "Water depth" should be changed to "Water depth distribution".
					Water year, especially drought years	**A-5 M-1 E-2**	The Water Year classification scheme may not serve tidal wetland monitoring very well. Measurements of the timing, duration, and magnitude of outflow and channel water salinities would be useful regardless of the water year type. * emphasize wet years as well	
			level of tidal inundation: full, muted or none	**A-7**	classification of wetlands according to level of tidal inundation: full, muted, or none	**A-7 E-2**	* classification important but not a monitoring element in of itself	
			topographic map (19)	**A-6 M-1 E-2**	*topographic map (19)*	**A-7 E-2**	* important but not monitoring element	
			tidal elevation (19)	**A-7 M-1 E-1**	tidal elevation (19)	**A-7 E-1**		

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1.3 Cont.			palustrine hydroperiod - timing and duration of standing water(19)	**A-5 M-1 E-2**				
			tidal regime - frequency & duration of tidal inundation (19)	**A-7 M-1 E-1**	estuarine tidal regime (19)	**A-7**		
			tidal prism - volume of tides passing through drainage network or channel during a tidal cycle (19)	**A-8 M-1**				
			water depth - height of water column above the ground and below an upper limit or high water datum (19)	**A-7 E-2**			* topographic map and tidal elevations will provide this info	
			wetted perimeter - shoreline of perimeter corresponding to high water datum (19)	**A-6 M-2**	*wetted area*	**A-6 M-1**	* It seems reasonable to include depth classes relative to the high water datum. Restoring tidal action to heavily subsided areas will likely result in excessive water depths * isn't this the same as 1.1?	
1.4	STATE: Vegetation community composition - brackish, saline, freshwater communities	What are the status and trends in the location and extent of vegetation communities in the estuary? Vegetation communities are affected by the salinity and hydrology of the estuary.	detailed vegetation mapping	**A-6 M-3**	*detailed vegetation mapping*	**A-5 M-4**	* To the extent possible, try and use the ERPP vegetative community typology or provide cross walk * mapping is important but what does detailed mean. Current GIS coverages are insufficient. * reduce level of detail on regional level	Consider adding “and specific species of concern”. Instead of the term “detailed vegetation mapping”, substitute “actual field surveys” at the local level and “remote sensing” at the regional level.
1.5	PRESSURE: Diking of wetlands	What is the extent of tidal wetlands now diked?	*Degree of patch tidal inundation inhibited due to human causes: full, muted or none*	**A-6 E-2**	extent of wetlands classified by degree of tidal inundation: full, muted, or none	**A-7 E-1**	* this seems to be a more regional question	

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1.6	PRESSURE: Water management strategies - altered flows, water diversions	What effects have altered flows and water diversions had on the salinity gradient in the estuary, its length and variability?			Delta inflow	A-7 M-2	* EVERYBODY MONITORS DELTA INFLOW * needs better definition * add local tributary inflow, groundwater discharge -- how have these been altered * under rationale -- I advocate a change in context for this rationale. Instead of focusing on the past, consider stating this in the present and future. For instance, "What effects do current water management strategies have on the magnitude, duration, and variability of flows in the Bay-Delta? How do those flows affect the magnitude, duration, and variability of channel water salinity and soil water salinity in tidal wetlands?" * all but the last are already monitored * merge with 1.2	
					Delta outflow	A-9	* EVERYBODY MONITORS DELTA OUTFLOW	
					Outflow through Golden Gate	A-7 E-2		
					Changes in X2 range, variability, seasonality	A-7 M-2	* X2 may not meet the needs for assessing tidal wetland maintenance. Consider a more sophisticated measure that can provide the needed information for the Bay and for larger channels in the Suisun Marsh and Delta.	
					Changes in vegetation reflecting changes in salinity gradient	A-6 M-2 E-1	* depends on level of detail -- indicator species needed	
1.7	PRESSURE: Effects of Operation of SMSCG (Suisun Marsh region only)	What effect has operation of the SMSCG had on vegetation? Have SMSCG induced changes in salinity and variability caused changes in vegetation communities.	Salinity levels, seasonal variability in areas affected by the SMSCG	A-6 M-2	Salinity levels, seasonal variability in areas affected by the SMSCG	A-6 M-2		This attribute should be generalized to “land use operatons” or “facility operations” and it should be made clear that this is really a covariate for interpreting other measures such a salinity levels. There are more gates and water control structures than just the Suisun Marsh Salinity Control Gate.
			Changes in vegetation associated with operation of SMSCG	A-6 M-1 E-1	Changes in vegetation associated with operation of SMSCG	A-6 M-1 E-1		

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1.8	PRESSURE: Water Quality -- local freshwater influx & nutrient influx	Where are changes in vegetation occuring due to human-caused changes in freshwater flows and nutrient levels?	proximity to discharger	A-6 M-2 E-1	Locations and types of discharges	A-6 M-3	* This whole area needs to be re-thought. It is insufficient to answer the question. I have seen veg function regardless of water quality, etc…	This should be another covariate under "facilities operation" (1.7). Nutrients are a problem both as point and non-point sources. The Cosumnes River has a major eutrophication problem. Dissolved Oxygen (DO) and Biological Oxygen Demand (BOD) should be monitored in shallow channels. DO can reach low enough levels to wipe fish out. The question was raised about whether this is covered under the aquatic monitoring plan? Specifically who is responsible for monitoring non-point water quality in shallow water habitats? The "source" of the contaminants needs to be clarified.
			Salinity levels and nutrient levels of discharges	A-8 M-2				
			turbidity	A-6 M-3				
			Vegetation changes in response to changes in water quality due to discharges	A-6 M-3 E-1			* yes but what types of species	
1.9	PRESSURE-REDIRECTED: Changes in channel flows due to through delta conveyance modifications (Delta region only)	Where are changes in channel conveyance affecting hydrology in parts of the Delta?	changes in patch hydrology	A-7 M-2	Changes in flow rates and directions at various points in delta	A-8	* Likely to be in aquatics plan * unclear what changes in patch hydrology are * flow diversions affect salinity gradient	
1.10	PRESSURE-NATURAL: Temperature, climate, floods & droughts	El nino effects, droughts, and floods all affect wetland sustainability. High flood events move large amounts of sediment through the system. Droughts can allow the spread of non-indigenous plant species.			Occurrence of El nino effects, droughts, floods, flows	A-6 M-4	* OCCURRENCE OR IMPACT/RESPONSE? * Many more effects and mechanisms need to be considered * already done by NOAA * important but not specific enough. Need to characterize process with specific variables, e.g. hydrograph * just as important as "drought" years * Floods can also help facilitate the spread of nonnative plants. Establishment of some nonnative plants increases sedimentation.	This is really a covariate for interpreting other changes

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1.11	PRESSURE-NATURAL: Sea level Rise	Sea level rise is expected to have several effects on the estuary-- * possible changes in the extent of vegetated marsh plain if marsh plain elevation rise cannot keep pace with changes in sea level * possible changes in the salinity gradient in the estuary as sea water encroaches further into the estuary.			*Sea level at fixed point in estuary (Golden Gate Bridge ?)*	**A-8 M-1**	* Change attribute to "Relative Sea level rise" * add "mapping of locations where urbanization inhibits the natural migration of wetlands inland" * done by NOAA * location unclear * Presidio?	Monitoring sea level rise is necessary and is already occurring. Consider changing the attribute title to “relative sea level rise”. Consider analyzing changes in MHHW level as well as sea level. Sea level should be monitored at multiple points in the estuary (currently there are 4). “Water level or depth” will give results at the local level.
					Changes in X2 range, variability, seasonality	**A-2 M-4 E-3**	* How do you separate this from discharge effects? * already done * impractical to measure these changes over the short-term (10-20 years) unless sea level changes become more dramatic * not necessary here, mentioned elsewhere * combine with 1.2	
					Changes in vegetation reflecting changes in salinity gradient	**A-4 M-2 E-3**	How do you separate this from discharge effects? * add * impractical to measure these changes over the short-term (10-20 years) unless sea level changes become more dramatic * see above under changes in vegetation * combine with 1.2	
					Extent of vegetated marsh plain	**A-5 M-1 E-2**	How do you separate this from discharge or sedimentation effects? * impractical to measure these changes over the short-term (10-20 years) unless sea level changes become more dramatic * too many other variables affect this one	
1.12	ACTION: Restore tidal flows to diked wetlands by breaching dikes in suitable areas (9)	restore tidal flows to diked wetlands by breaching dikes in suitable areas (7)			Extent, location, & status of diked wetlands & muted wetlands re-opened to tidal influence	**A-7 M-1**	* unnecessary. Use classification scheme tidal, muted, etc.	
1.13	ACTION: Balance seasonal flows from reservoirs for fisheries, water conveyance, flood control, and the needs of other habitats	In ERPP: Balance seasonal flows from reservoirs for fisheries, water conveyance, flood control, and the needs of other habitats (7)			Delta inflow	**A-6 M-2**	* changes in Delta hydrograph	

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1.14	ACTION: Establish desirable salinity gradients	In ERPP:Establish desirable estuarine salinity gradients by managing water diversions and water releases from upstream reservoirs to control seasonal freshwater inflows to the Delta (7)			*detailed vegetation mapping*	**A-6 M-1 E-1**	* confusing, connection too vague	
1.15	ACTION: balance seasonal flows to meet habitat needs	In ERPP: Balance seasonal flows from reservoirs for fisheries, water conveyance, flood control, and the needs of other habitats			*detailed vegetation mapping*	**A-6 E-2**	* confusing, connection too vague	
NEW	PRESSURE-REDIRECTED: Effects of operation of Agricultural Flow control structures (Delta region only)	What effect does operation of the Flow control structures on vegetation? How does Flow control structure operations affect tidal stage, salinity levels and variability and how can those effects influence the ecological functions of existing and restored tidal wetlands.	Salinity levels, seasonal variability in areas affected by the flow control structures	**New**	Salinity levels, seasonal variability in areas affected by the flow control structures	**New**	It will be a challenge to assess how proposed operations will affect existing and restored tidal wetlands expecially considering the natural variation in these factors.	This attribute should be combined with 1.7 under “facility operations”.
			Changes in vegetation associated with operation of the flow control structures	**New**	Changes in vegetation associated with operation of the flow control structures	**New**	Same comment as above	
HORIZONTAL & VERTICAL MARSH PLAIN ACCRETION & EROSION (ERP Strategic Objective 2.3)								
1.16	STATE: Horizontal Marsh Accretion & Loss: Erosion & Deposition processes	What are the status and trends in the sediment budget in the estuary? The extent and location of mudflats reflects the amount of sediment coming into the estuary. Shoreline change shows where marsh is being lost and gained.	Extent & location of mudflats	**A-8 M-1 E-1**	*Status & trends in extent and location of tidal mud flats*	**A-9**	* Need to address role of wind in affecting sediment transport, mudflat progradation/aggradation, and topographic complexity. * regional variable * volume of mudflats can change seasonally, not just reflecting the amount of sediment coming into the estuary.	<We did not get to this section during the workshop>
			Extent of vegetated marsh plain	**A-8 M-1 E-1**	*Extent of vegetated marsh plain*	**A-9 E-1**		
			Shoreline change in patch	**A-8 M-1 E-1**	*Shoreline change*	**A-8 M-1 E-1**	* unclear how measured -- linear extent?	

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1.16 cont.			Area of mid-channel island or shoal	**A-7 M-1 E-1**	Area of midchannel islands and shoals	**A-7 M-1 E-1**	* Consider describing and presenting these data by agreed upon geographic sub-region e.g. south Delta.	
1.17	STATE: Vertical Marsh Plain Accretion: marsh plain tidal elevation	Is marsh plain elevation being maintained relative to sea level? Maintenance of marsh plain elevation is a combination of sediment accumulation & erosion, biomass accumulation & oxidation, and sea level rise.	*Extent of vegetated marsh plain*	**A-6 M-2**	*Extent of vegetated marsh plain*	**A-7 M-1**	* add suspended sediment monitoring * Need to address role of wind in affecting sediment transport, mudflat progradation/aggradation, and topographic complexity. * Need to reconstruct accretion history using sediment core analyses * Use representative patches -- can't do everywhere * combine with 1.3	
			Shoreline change in patch	**A-5 M-3**	*Shoreline change*	**A-6 M-2**		
			tidal elevation/topographic map	**A-6 M-2 E-1**	tidal elevation/topographic map	**A-6 M-2 E-1**	* unclear how used	
			vertical accretion & subsidence	**A-6 M-3**	vertical accretion & subsidence	**A-6 M-2 E-1**	* Under rationale - Biomass compaction/peatification also contribute * how is it measured	
			water depth	**A-5 M-2 E-1**	*Sea level at fixed point in estuary (Golden Gate Bridge ?)*	**A-6 M-1 E-2**		
1.18	PRESSURE: Diking of wetlands	Diking of wetlands cuts off the supply of sediment into diked wetlands and can contribute to subsidence.	*Degree of patch tidal inundation due to human causes: full, muted or none*	**A-6 M-2 E-1**			* unclear * combine with 1.5	
			marsh plain elevation relative to non-diked wetlands	**A-7 M-2 E-1**	area of subsided lands & degree of subsidence	**A-7 M-2 E-1**		
1.19	PRESSURE-NATURAL: Sediment loading into Delta is changing as sediments from mining are flushed through system	Addresses concerns that the sediment supply that helps sustain tidal wetlands will diminish and marsh plain rise will not keep pace with the rise in sea level			*Status & trends in extent and location of tidal mud flats*	**A-7 M-1**	WOEFULLY INADEQUATE. Need to add sediment coring to assess regional history of sedimentation. Also need to monitor sediment loading as it occurs	
1.20	PRESSURE-NATURAL: Sea level rise	Sea level rise may effect the extent of vegetated marsh plain if marsh plain elevation cannot keep pace with changes in sea level			*Sea level at fixed point in estuary (Golden Gate Bridge ?)*	**A-5 M-3 E-1**	* Need to account for "relative" sea level rise issues * Numerous sites are probably necessary * combine with 1.11	

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1.21	PRESSURE-REDIRECTED: Changes in sediment loads downstream of newly created wetland sites & flooded islands	What effect have flooding islands had on the sediment budget in the estuary? Are islands flooded without restoring land elevations creating sediment sinks which can effect wetlands downstream?	changes in extent & location of tidal flats downstream of flooded islands	**A-5 M-1**			* How long does it take for changes to be measurable? 5 years, 25 years? * Causal connection? * Under rationale -- Consider changing to present and future tense, e.g. "What effect will flooding islands have on the sediment budget in the estuary? Will flooding islands without restoring land elevations create sediment sinks which can effect wetlands downstream?" * Need to monitor as well as map. Mapping alone will not give you an accurate sediment budget. * Delta is tidal. effects can occur both upstream and downstream * newly flooded islands also affect flows in the channels	
			Shoreline change downstream of flooded islands	**A-5 M-1**			* sediment will be affected on both sides, not just downstream	
1.22	PRESSURE-REDIRECTED: changes in channel flows due to through delta conveyance modifications	changes in delta conveyance may affect the location of sediment accretion and erosion in the Delta	changes in extent & location of tidal flats downstream of flooded islands	**A-4 M-2 E-1**			* Causal connection? * Need a historic monitoring baseline for comparison * patch size/number	
			Shoreline change downstream of flooded islands	**A-4 M-2 E-1**				
NEW	PRESSURE-REDIRECTED: Changes in channel flows due to operation of Agricultural Flow control structures	Operation of Agricultural Flow control structures may affect the location of sediment accretion and erosion in the Delta	changes in extent & location of tidal flats downstream of flooded islands	**New**				
			Shoreline change downstream of flooded islands	**New**				
NEW	PRESSURE-REDIRECTED: Changes in channel flows due to large scale dredging in Delta channels.	Large scale dredging may affect the location of sediment accretion and erosion in the Delta	changes in extent & location of tidal flats downstream of flooded islands	**New**			* The construction of sediment collecion basins has also been proposed in the south Delta. Consider adding this to the monitoring table. Monitoring elements are likely to be the same. In the case of large scale Delta-wide dredging, a regional monitoring element may need to be considered.	
			Shoreline change downstream of flooded islands	**New**				

TABLE TW1. SUMMARY OF COMMENTS - Tidal Wetland Maintenance and Sustainability due to Physical & Ecological Processes

This table summarizes the Tidal Wetlands workshop comments (8/30/2000) in the same format that workshop participants conducted the review. See Figure 2 for the key.

			Patch / Local Site		Regional level			
No.	State, Pressure or Action Attribute	Rationale	Monitoring Element	Eval-uation	Monitoring Element	Eval-uation	Pre- and Post- Workshop Comments	Comments during workshop
TIDAL CHANNELS AND TOPOGRAPHIC COMPLEXITY (ERP Strategic Objective 2.3)								
1.23	STATE: tidal channel networks	How much of the tidal wetlands contain sustainable tidal channel networks? This is a CALFED objective.	*patch size*	**A-7 M-1 E-1**	*patch size of tidal wetlands*	**A-7 M-1 E-1**	* Need to know if there is a role of animals in creating/maintaining tidal channels * confusing in reference to this question or redundant	<We did not get to this section during the workshop>
			age of patch	**A-7 E-2**	*age of tidal wetland patches*	**A-7 E-2**	* confusing in reference to this question or redundant	
			tidal elevation/topographic map	**A-8 E-1**	tidal elevation/topographic map	**A-8 E-1**		
			tidal channel density -- total length of channel per unit area of ground surface (19)	**A-8**	linear extent of tidal channels by network order	**A-9**		
			network order (19)	**A-8**	*Acreage of tidal wetlands with established tidal channel networks containing 4th order channels*	**A-8 M-1**	* Why 4th order?	
			channel gain/channel loss	**A-9**	channel gain/channel loss	**A-8 M-1**	* ratio may be difficult to use regionally. How is it defined?	
			tidal channel morphology: cross-sectional profile, longitudinal profile, meander geometry (19)	**A-8 M-1**		**A-7**	* useful in some cases	
1.24	STATE: topographic complexity: patches with marsh pannes, ponds, complex channel networks	How much of the tidal wetlands show mature topographic complexity? Topographic complexity increases the complexity and variety of vegetation communities and species habitats.	*patch size of tidal wetlands*	**A-9**	*patch size of tidal wetlands*	**A-7 M-1**	* Need to address role of wind in affecting sediment transport, mudflat progradation/aggradation, and topographic complexity. * how is it used for regional analysis	
			age of tidal wetland patches	**A-8 E-1**	*age of tidal wetland patches*	**A-6 E-2**	* difficult for regional analysis	
			network order (19)	**A-9**	*Number, area, and location of tidal wetland patches with established tidal channel networks containing 4th order channels*	**A-7 M-1**	* Why 4th order?	
			Number of ponds & pannes	**A-8 E-1**	Number, area, and location of tidal wetland patches containing ponds & pannes	**A-7 M-1**		

TABLE TW1. SUMMARY OF COMMENTS - Tidal Wetland Maintenance and Sustainability due to Physical & Ecological Processes

This table summarizes the Tidal Wetlands workshop comments (8/30/2000) in the same format that workshop participants conducted the review. See Figure 2 for the key.

			Patch / Local Site		Regional level			
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Eval-uation**	**Monitoring Element**	**Eval-uation**	**Pre- and Post- Workshop Comments**	**Comments during workshop**
1.25	PRESSURE: Small patch size	Large patch size is important for establishing tidal channels and the full range of topographic complexity. Many tidal wetlands patches are too small to establish these processes.	*Patch size*	**A-5 E-1**	*Patch size distribution*	**A-6 E-1**	* Need to know if animals have played a role in creating topographic complexity.	
					Number of patches > 1000 acres	**A-6 E-1**	* Will always be availabe from patch size distribution (redundant)	
1.26	ACTION: Tidal wetland restoration actions.	<See Table on Habitat Extent & Connectivity>			<See Table on Habitat Extent & Connectivity>	**A-4**		
DELTA SLOUGHS BANK VEGETATION AND SHORELINE EDGES (ERP Strategic Objective 2.3, 4.1)								
1.27	STATE: Delta sloughs with vegetated banks & unhardened shoreline edges	What is the linear extent of sloughs & Delta channels with vegetated, non-hardened banks? Vegetated, non-hardened Delta sloughs can increase connectivity between tidal wetland patches in the Delta and also support those species that exist along the banks and eroding margins of delta channels			linear extent of sloughs with vegetated, non-hardened banks	**A-6 M-3**	* Need to use existing models of slough dynamics to identify monitoring locations * redundant with element above * classify all slough banks, not just identify to one type	<We did not get to this section during the workshop>
1.28	PRESSURE: Shoreline change in areas of high boat traffic	What areas in the Delta are experiencing meaningful levels of erosion due to boat wakes? Boat wake erosion is causing shoreline erosion in local areas of the Delta and in particular are affecting midchannel islands and shoals.	If high boat traffic area, shoreline change attributed to boat wake erosion	**A-6 M-2**	areas of high boat traffic	**A-7 M-1 E-1**	* how do you separate the effects of boat traffic from other factors (wind)? * there are many causes of erosion, boat traffic should not be the only factor examined.	
					shoreline change in tidal wetlands in areas of high boat traffic	**A-6 M-3**	* what is change? * unclear how used for regional analysis	
1.29	PRESSURE: Shoreline hardening	What is the extent of artificially hardened Delta channels & sloughs?	Extent & location of shoreline/bank hardening measures, I.e. rip-rap	**A-7 M-1 E-1**	Extent & location of shoreline/bank hardening measures	**A-7 M-1 E-1**	* combine with 1.27	
1.30	ACTION: Reduce the effects of boat wakes in sensitive habitat	In ERPP: Reduce the effects of boat wakes in sensitive habitat areas by excluding boats from certain areas at certain times and establishing maximum speed limits (7).			Extent, location, and status of areas receiving boat wake control measures	**A-8 E-1**		

TABLE TW1. SUMMARY OF COMMENTS - Tidal Wetland Maintenance and Sustainability due to Physical & Ecological Processes

This table summarizes the Tidal Wetlands workshop comments (8/30/2000) in the same format that workshop participants conducted the review. See Figure 2 for the key.

			Patch / Local Site		Regional level			
No.	State, Pressure or Action Attribute	Rationale	Monitoring Element	Eval-uation	Monitoring Element	Eval-uation	Pre- and Post- Workshop Comments	Comments during workshop
1.31	ACTION: Restore hydrologic conditions necessary for establishing Delta sloughs	In ERPP: Restore hydrologic conditions necessary for establishing Delta sloughs by constructing set-back levees, removing dikes, constructing slough openings, and managing flows through Delta channels (7)			Linear extent & status of Delta sloughs reconnected to tidal influence	A-7 M-2	* Need to monitor water depths and velocities in the sloughs and understand how these channels form and evolve.	
					Linear extent of Delta sloughs & channels with measures to set-back levees and reduce bank hardening	A-6 M-3	* wording confusing	

TABLE TW2. SUMMARY OF COMMENTS -- Tidal Wetland Habitat Extent & Connectivity

This table summarizes the Tidal Wetlands workshop comments (8/30/2000) in the same format that participants conducted the review. See Figure 2 for the key

No.	State, Pressure or Action Attribute	Rationale	Patch / Local Site level: Monitoring Element	Regional level: Monitoring Element	Eval-uation	Pre- and Post- Workshop Comments	Comments during workshop
GENERAL COMMENTS							
* All of these elements seem plausible. However prioritizing this list would be a more interesting exercise * Need to consider relation of tidal wetland changes to upland land use processes, which drive downstream effects							
HABITAT EXTENT (ERP Strategic Objectives 4.1, 4.3, 4.4)							
2.1	STATE: Habitat extent & spatial distribution	What are the status & trends in extent and spatial distribution of tidal wetland habitat since the baseline year?		Acreage and location of tidal freshwater, brackish, and saline wetlands	A-6 M-1	* Attempt to use ERPP classifications. Provide cross walk if needed.	* Add the patch/local site level monitoring
				Acreage, number, type and location of various important sub-habitats in tidal wetlands	A-5 M-2	* Attempt to use ERPP classifications. Provide cross walk if needed.	
				Linear extent and location of Delta sloughs	A-5 M-2	* yes but what types * consider adding area at high/low tide	
				Number, acreage, and location of mid-channel islands & shoals	A-7	* add also north bay sloughs	
				Linear extent and location of vegetated delta levees and delta levee benches	A-7		
2.2	STATE: Patch size frequency	What is the distribution in patch sizes?		Number & area of tidal wetland patches	A-5 E-1	* too vague, define	* Depends on what we mean by patch. Also depends on extent of tidal exchange. This attribute is repetitive of other attributes previously discussed. A simpler format would be preferred or a more specific rationale for why each attribute is included in multiple places.
2.3	STATE: Habitat gain & loss due to natural processes	<See Review Form 1>		Location & distribution of changes in extent of habitat due to hydrologic, geomorphic, and energetics processes	A-5 M-1 E-1	* include habitat acreage lost due to boat wake and wind erosion * unsure, but may be too difficult and costly to track on a regional level. Link up with other programs to measure change due to sea level rise, etc. * need to define changes	

TABLE TW2. SUMMARY OF COMMENTS -- Tidal Wetland Habitat Extent & Connectivity

This table summarizes the Tidal Wetlands workshop comments (8/30/2000) in the same format that participants conducted the review. See Figure 2 for the key

			Patch / Local Site level	Regional level			
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Monitoring Element**	**Eval-uation**	**Pre- and Post- Workshop Comments**	**Comments during workshop**
2.4	PRESSURE: Habitat loss due to land conversion	How much tidal wetland acreage was converted to other land uses since baseline? Where is it located?		Location and acreage of tidal freshwater, brackish, and saline wetlands converted to other land uses since baseline.	**A-5 M-1**		
				Location & linear extent of delta sloughs lost due to conversion to other land uses or disconnection from tidal action	**A-6**		
		How much tidal wetland acreage has been lost due to CALFED actions?		Extent & location of tidal wetland habitat lost due to CALFED actions.	**A-6 E-1**	* Assume this is for conveyance?	
2.5	PRESSURE: Potential habitat loss due to land conversion	Where and how much tidal wetland acreage is at-risk of being converted to other land uses		Location & acreage of areas of tidal wetland at risk of being converted to other land uses	**A-4 M-3**	* This monitoring element needs to also assessing the risk of being adversely impacted by adjacent, incompatible land uses. Consider monitoring land uses in a quarter to one-mile buffer area around tidal wetlands. * hard to quantify, but good to know to the extent possible * define "at risk"	It was felt that there will be little direct conversion of tidal wetlands themselves except at very local levels. County land use plans could be used to project potential conversion. But is this a science issue? "at risk" is a bad term. Maybe instead monitor land that is in known planning to be converted during the next 5 years. This is a politically loaded issue – it should either be dropped or carefully re-worded.
				Location & acreage of habitats adjacent to tidal wetlands at risk of being converted to other land uses & projected type of new land use.	**A-5 M-2**	* hard to quantify, but good to know to the extent possible	
				Location, distance to, and extent of urbanization near tidal wetlands	**A-5 M-2**	* see indicators report	
				Land use adjacent to tidal wetlands	**A-5 M-2**	* hard to quantify, but good to know to the extent possible	
				Acreage and location of upland habitat types adjacent to tidal wetlands in public ownership	**A-5 M-2**	* hard to quantify, but good to know to the extent possible	

TABLE TW2. SUMMARY OF COMMENTS -- Tidal Wetland Habitat Extent & Connectivity

This table summarizes the Tidal Wetlands workshop comments (8/30/2000) in the same format that participants conducted the review. See Figure 2 for the key

			Patch / Local Site level	Regional level			
No.	State, Pressure or Action Attribute	Rationale	Monitoring Element	Monitoring Element	Eval-uation	Pre- and Post- Workshop Comments	Comments during workshop
2.6	ACTION: Tidal wetland acreage restored	Where and how much tidal wetland habitat has been restored? Tidal wetland restoration actions include: * Restoration of Delta sloughs, tidal perennial aquatic habitat, fresh emergent wetland, saline emergent wetlands * Restore and maintain high quality mid-channel islands and shoals * Restoring land elevations, setting back levees, and opening or breaching levees * restore hydrologic conditions necessary for establishing Delta sloughs by constructing set-back levees, removing dikes, constructing slough openings, and managing flows through Delta channels (7)		Extent, location, restoration status of restoration projects in tidal freshwater, brackish, and saline wetlands.	A-6 M-1	* extent and location of projects should be tracked through database at ICE. Database should be moved to more central location. Restoration status needs definition.	
				Extent, location, & restoration status of diked wetlands re-opened to tidal influence	A-6 M-1	* Restoration status needs definition.	
				Extent, location, and restoration status of Delta sloughs reconnected to tidal influence due to CALFED actions	A-6 M-1	* Restoration status needs definition.	
				Changes in linear extent of vegetated levees along Delta sloughs and channels due to changes in levee maintenance	A-6 M-1	* Restoration status needs definition.	
				Change in linear extent of vegetated benches along levees	A-4 M-3	* add "and aerial extent" * what type of vegetation. Should discriminate between desireable and undesireable.	
				Extent, location, & restoration status of CALFED mitigation projects in tidal freshwater, brackish, and saline wetlands.	A-5 M-2	* Attempt to use ERPP classifications. Provide cross walk if needed.	
2.7	ACTION: Acreage of Delta sloughs, tidal wetlands, and adjacent habitats protected	How much tidal wetlands acreage has been protected due to CALFED actions?		Acreage of land purchased or otherwise protected through CALFED actions	A-6 E-1	* we need to clearly segregate categories, so things are not counted twice, I.e. protection does not include restored areas, etc.	
				Change in tidal wetland acreage under protection status	A-6 M-1	* we need to clearly segregate categories, so things are not counted twice, I.e. protection does not include restored areas, etc.	
				Change in protection level of upland habitat adjacent to tidal wetlands	A-5 M-1	* we need to clearly segregate categories, so things are not counted twice, I.e. protection does not include restored areas, etc.	

TABLE TW2. SUMMARY OF COMMENTS -- Tidal Wetland Habitat Extent & Connectivity

This table summarizes the Tidal Wetlands workshop comments (8/30/2000) in the same format that participants conducted the review. See Figure 2 for the key

No.	State, Pressure or Action Attribute	Rationale	Patch / Local Site level: Monitoring Element	Regional level: Monitoring Element	Eval-uation	Pre- and Post- Workshop Comments	Comments during workshop
CONNECTIVITY AMONG TIDAL WETLAND PATCHES (ERP Strategic Objectives 4.1, 4.3, 4.4)							
2.8	STATE: Connectivity between patches & groups of patches	To what degree are tidal wetlands spatially connected relative to isolation of species or populations?		Spatial distribution of patches	A-6 E-1	* not quantifiable in current form	
				Habitat pattern indices (patch contagion & interspersion, patch cohesion, inter-patch distance, distribution, etc.)	A-6 M-1	* good ideas, but need pros and cons of each	
				acreage of contiguous habitat	A-7	* simple, so good as an indicator	
				dispersal success rate for some indicator species?	A-6 E-1	* use for species effects * how much of this is known?	
2.9	PRESSURE: Barriers to species movement	Barriers block movement between patches for species		Location of barriers to species movement (roads, levees, urban areas, etc)	A-7		
2.10	PRESSURE: Land conversion	Land conversion can decrease connectivity between patches, by reducing vegetation on levees, by changing to less wildlife friendly agricultural practicies, or by urbanization		Changes in land use over time	A-5 M-2	* important but not measurable as stated	
2.11	PRESSURE: Potential land conversion			Maps showing potential or anticipated land use conversion	A-7		
2.12	ACTION: Tidal wetlands restored	ERPP: Tidal wetland restoration actions include: * Restoration of Delta sloughs, tidal perennial aquatic habitat, fresh emergent wetland, saline emergent wetlands * Restore and maintain high quality mid-channel islands and shoals * Restoring land elevations, setting back levees, and opening or breeching levees		Extent, location, restoration status of restoration projects in tidal freshwater, brackish, and saline wetlands.	A-6		
				Extent, location, and status of new levee maintenance efforts that allow for vegetated levees along Delta sloughs and channels	A-5 E-1	* included in 2.6	

TABLE TW2. SUMMARY OF COMMENTS -- Tidal Wetland Habitat Extent & Connectivity

This table summarizes the Tidal Wetlands workshop comments (8/30/2000) in the same format that participants conducted the review. See Figure 2 for the key

No.	State, Pressure or Action Attribute	Rationale	Patch / Local Site level: Monitoring Element	Regional level: Monitoring Element	Eval-uation	Pre- and Post- Workshop Comments	Comments during workshop
2.12 cont.		* restore hydrologic conditions necessary for establishing Delta sloughs by constructing set-back levees, removing dikes, constructing slough openings, and managing flows through Delta channels (7) * Modify, where consistent with flood control objectives, levee vegetation management practices to allow wetland vegetation to naturally reestablish (7) * Build innovative benches to support shoreline habitats, where levees must remain (7)		Extent, location, and restoration status of projects to create vegetated benches along levees	A-5 M-1 E-1	* seems redundant- group rest. project status- monitoring elements	
2.13	ACTION: Habitat Corridors created	Creation of North Delta Habitat Corridor -- provide contiguous habitat corridor connecting the mosaic of tidal marsh, seasonal floodplain, riparian and perennial grassland habitats in the Yolo Bypass, Cache Slough Complex, Prospect Island, Little Holland Tract, Liberty Island, and Steamboat Slough		Extent, location, and habitat type of various pieces of North Delta Habitat Corridor	A-5 M-1	* too vague- important but monit. Elements included under other attributes. What about corridors? * why is this specific item identified instead of a general habitat corridor item. If north Delta corridor is not a done deal, this could be perceived as advocacy	This attribute needs to be generalized since currently it only talks about the North Delta corridor. How a corridor is defined may be too dependent on the individual species and has already been mentioned elsewhere. Maybe "corridors" is a term more appropriate for riparian areas.

TABLE TW3. Summary of Comments -- Tidal Wetland Habitat Quality in Support of Biodiversity, including MSCS Species

This table summarizes the Tidal Wetlands workshop comments (8/30/2000) in the same format that participants conducted the review. See Figure 2 for Key.

			Patch / Local Site level		Regional level			
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Evaluation**	**Monitoring Element**	**Evaluation**	**Pre- and Post- Workshop Comments**	**Comments during workshop**
GENERAL COMMENTS								
* Numbers 3.27 through 3.32 are somewhat repetitious with attributes and monitoring elements presented earlier in this table or other tables. I will defer to those and any comments made. I agree with monitoring elements for numbers 3.33 to 3.38 and and 3.41 to 3.47. * Most of these monitoring elements seem reasonable. Concerned that swans and northern pintails are not mentionned as at least "m" species. Concerned that all of the monitoring measures are aimed at tidal wetlands with no mention of habitat value lost by conversion of diked wetlands. The process of monitoring a site should begin before conversion has taken place and the existing habitat value, species diversity, species richness, etc. should be measured. * Patch size monitoring practicality depends on the number and size of patches * There are temporal scales of variability that affect marsh parameters, and that should therefore be taken into account when designing sampling regimes: I forgot to include the spring-neap and tropic (lunar declination) tide cycles (about 14 days each), and the lunar day and solar day cycles (25 and 24 hours, respectively). * How or when is monitoring in diked wetlands, particularly in the brackish and saline areas of the Suisun Marsh and San Pablo Bay to be addressed. * Nevertheless, diked wetlands in the Delta and Bay are tremendously important to wildlife including MSCS species such as the salt marsh harvest mouse, greater sandhill crane, and Swainson's hawk. If these aren't intended to be addressed in workshop 2 then an additional table needs to be prepared to monitor diked wetlands							
VEGETATION COMMUNITY STRUCTURE (ERP Strategic Objectives 1.3, 4.1, 5.5, 5.7, 6.1)								
3.1	STATE: Mosaic of vegetation communities	What are the extent and location of the various vegetation communities in tidal wetlands? Mapping of vegetation is critical to assessing status and trends in vegetation, habitat for species, and the effects of hydrologic & geomorphic processes on habitat. Patch topography, patch age, and previous land use history are important covariates for assessing current vegetation communities and the succession directions they will likely proceed upon.	*detailed vegetation mapping*	**A-6 M-1**	*detailed vegetation mapping*	**A-6 M-1**		Instead of the term "detailed vegetation mapping", substitute "actual field surveys" at the local level and "remote sensing" at the regional level. Attributes 3.1 and 3.2 really should be combined. 3.1 is really more regional monitoring whereas 3.2 is more local site monitoring. However community and species should be differentiated.
			spatial distribution of sub-habitat types/vegetation communities	**A-6 M-1**	*spatial distribution of sub-habitat types/vegetation communities*	**A-6 M-1**		
			topography	**A-6 E-1**	*regional topography*	**A-6 E-1**		
			age/maturity of patch	**A-6 M-1**	*ages of patches of tidal wetlands and/or time since restoration efforts*	**A-6 M-1**	* vague, what is a patch?	
			patch site history relative to anthropogenic disturbance	**A-5 M-2**			* important but vague, are you referring to narrative? * add regional pollen and macrofossil spectra. Pollen can be extracted from wetland sediment to give a local and regional perspective of vegetation community	
3.2	STATE: Vegetation community structure	What are the status and trends in vegetation community structure and composition? What are the status & trends in relative abundance of non-indigenous plant species?	species diversity (19)	**A-7 M-1**			* what type of measurement, many forms of diversity indices	Additional variables should be added under "key indicator species" than just abundance, i.e. vigor, biomass, livecrop vs. dead crop. Consider adding reporting, identification, and distribution of unidentified plants at the regional level. There was some discussion about whether reporting and identification of unknown plants was necessary. Some participants felt researchers already identified all plants. Others disagreed and felt this was necessary.
			species richness (19)	**A-8**				
			key indicator species distribution and abundance	**A-8**			* what species?	
			MSCS plant species distribution & abundance	**A-8**			* MSCS plant distribution needs to monitored at a regional level as well	
			relative abundance of non-indigenous plant species (19)	**A-8**	relative abundance of non-indigenous plant species across sites	**A-8**		
			reporting of unidentified plants	**A-5 E-2**			* Unidentified plants will be keyed and identified and not likely left unidentified	

TABLE TW3. Summary of Comments -- Tidal Wetland Habitat Quality in Support of Biodiversity, including MSCS Species

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			Patch / Local Site level		Regional level			
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Evaluation**	**Monitoring Element**	**Evaluation**	**Pre- and Post- Workshop Comments**	**Comments during workshop**
3.2 Cont.			presence/absence of key non-indigenous plant species	**A-8**	distribution & size of patch of key non-indigenous plant species (water hyacinth, egeria, etc.)	**A-8**		Drop "successional direction" Add "percent cover" and "standing crop" to regional level
			percent cover (19)	**A-7 M-1**				
			standing crop (19)	**A-6 M-1**				
			canopy structure & composition	**A-5 M-1 E-1**			* depends on project and method. More important for riparian communities	
			successional direction	**A-5 E-2**			* depends on project and method. More important for riparian communities	
3.3	STATE: Wetland hydrology & salinity	Wetland hydrology & salinity levels are important covariates for vegetation community composition & structure	level of tidal inundation: full, muted or none	**A-6 M-1**	classification of wetlands according to level of tidal inundation: full, muted, or none	**A-6 M-1**	* Consider an effort classify tidal wetlands using depth classes. * redundant. See comments on review form 1.	Clarify what is meant by "tidal cycle" and standardize.
			palustrine hydroperiod - timing and duration of standing water(19)	**A-5**				
			tidal regime - frequency & duration of tidal inundation (19)	**A-6**	estuarine tidal regime (19)	**A-5 E-1**		
			tidal prism - volume of tides passing through drainage network or channel during a tidal cycle (19)	**A-6**				
			water depth - height of water column above the ground and below an upper limit or high water datum (19)	**A-4 M-1 E-1**			* Consider an effort classify tidal wetlands using depth classes.	
			soil salinity	**A-5 E-1**				
			wetted perimeter - shoreline of perimeter corresponding to high water datum (19)	**A-5 E-1**	wetted area	**A-4 E-1**		

TABLE TW3. Summary of Comments -- Tidal Wetland Habitat Quality in Support of Biodiversity, including MSCS Species

This table summarizes the Tidal Wetlands workshop comments (8/30/2000) in the same format that participants conducted the review. See Figure 2 for Key.

			Patch / Local Site level		Regional level			
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Evaluation**	**Monitoring Element**	**Evaluation**	**Pre- and Post- Workshop Comments**	**Comments during workshop**
3.4	STATE: topographic complexity & tidal channels: patches with marsh pannes, ponds, complex channel networks	Wetland topographic complexity and tidal channels are important covariates for vegetation community composition & structure	Patch size	**A-6**	patch size frequency	**A-6**		
			age of patch	**A-5 E-1**	age of tidal wetland patches	**A-5 E-1**	* redundant	
			topographic map (19)	**A-5 E-1**	topographic map (19)	**A-5 E-1**		
			tidal elevation (19)	**A-5 M-1 E-1**	tidal elevation (19)	**A-5 E-2**		
			Extent of vegetated marsh plain	**A-5 M-1**	Extent of vegetated marsh plain	**A-4 M-1 E-1**		
			tidal channel density -- total length of channel per unit area of ground surface (19)	**A-6**	linear extent of tidal channels by network order	**A-4 M-1 E-1**	* doesn't seem appropriate for regional analysis	
			network order (19)	**A-5**	Number, area, and location of tidal wetland patches with established tidal channel networks containing 4th order channels	**A-1 M-1 E-1**	* doesn't seem appropriate for regional analysis	
			presence of pannes and ponds	**A-4 M-1**	Number, area, and location of tidal wetland patches containing ponds & pannes	**A-1 E-1**	* doesn't seem appropriate for regional analysis	
3.5	STATE: Water quality	Wetland water quality is an important covariate for vegetation community composition & structure	suspended sediment (19)	**A-6**			* water quality measures depend on purpose of restoration. I have accepted measures that are easiest to measure or important to determine restoration progress.	Monitoring water and sediment quality is necessary although maybe it should be called a pressure instead. Nutrients and inorganic chemistry should be added. The term “chemistry” should be defined, i.e. pH, acid sulfate, soil organic content. Sediment quality should be changed to “soil/sediment” Mercury should be added.
			turbidity (19)	**A-6 E-1**				
			temperature (19)	**A-6 E-1**				
			conductivity (19)	**A-7**				
			chemistry (19)	**A-5**				
			contaminants (19)	**A-5 M-2**				

TABLE TW3. Summary of Comments -- Tidal Wetland Habitat Quality in Support of Biodiversity, including MSCS Species

This table summarizes the Tidal Wetlands workshop comments (8/30/2000) in the same format that participants conducted the review. See Figure 2 for Key.

			Patch / Local Site level		Regional level			
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Evaluation**	**Monitoring Element**	**Evaluation**	**Pre- and Post- Workshop Comments**	**Comments during workshop**
3.6	STATE: Sediment quality	Wetland sediment quality is an important covariate for vegetation community composition & structure	hydraulic conductivity (19)	**A-6**				
			bioturbation depth (19)	**A-5**				
			sediment texture (19)	**A-5**				
			depth of detritus (19)	**A-5**				
			redox potential (19)	**A-6**				
			bulk density (19)	**A-5**				
			chemistry (19)	**A-5 M-1**			* too vague. Need to determine key elements for each area, e.g. mercury in north Bay	
			contaminants (19)	**A-5 M-1**			* too vague. Need to determine key elements for each area, e.g. mercury in north Bay	
3.7	PRESSURE: local disturbances (mosquito control, hyacinth control, levee maintenance activities, boat wakes)	Local disturbances to vegetation are important covariates for vegetation community composition & structure	?	**M-1**	?	**M-1**	* Add for both patch and regional -- "Area subjected to mosquito control and invasive aquatic plant species control in the Bay-Delta. Area subjected to levee maintanence activities that influence tidal wetlands"	
3.8	PRESSURE: New introductions of Non-indigenous plants	What new introduced plant species have been observed in tidal wetlands	Identify unknown plant species during sampling of vegetative	**A-5 M-1 E-1**	Identify unknown plant species from individual sampling sites	**A-5 E-2**	Unidentified plants will be keyed and identified and not likely left unidentified * introduced = unknown?	
					Maintain information clearinghouse to report new plants established in region	**A-7**		
3.9	PRESSURE: Non-indigenous plants growth, spread, competition	What are the status and trends in the relative abundance of non-indigenous plants in tidal wetlands? What are the status and trends in distribution of key non-indigenous plant species?	relative abundance of non-indigenous plants in vegetation sampling	**A-7**	relative abundance of non-indigenous plants in within vegetation types, across all vegetation types	**A-6 M-1**	* distribution for plants (area and timing)	
			presence/absence of key non-indigenous plant species (water hyacinth, egeria, etc.)	**A-8**	distribution & size of patch of key non-indigenous plant species (water hyacinth, egeria, etc.)	**A-7**		
3.10	PRESSURE-NATURAL: Temperature, climate, floods & droughts	El nino effects, droughts, and floods affect vegetation. Non-indigenous plant spread can be greatest during periods of drought			Occurrence of El nino effects, droughts, floods	**A-6 E-1**		

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3.11	ACTION: Reduce the effects of boat wakes in sensitive habitat areas	ERPP: Reduce the effects of boat wakes in sensitive habitat areas by excluding boats from certain areas at certain times and establishing maximum speed limits (7)				**A-3 M-1 E-1**	* Add under regional "Increase in vegetation cover in areas where boating control measures have been initiated or wave reduction practices employed." * redundant	
3.12	ACTION: Modify vegetation management practices along levees	ERPP: Where consistent with flood control objectivies, modify vegetation management practices along levees to allow wetland vegetation to reestablish naturally (7)			Increase in vegetation cover in areas where vegetation management practices along levees have been modified.	**A-5 E-2**	* redundant	
3.13	ACTION: Restore a more natural elevation gradient in wetlands	ERPP: Restore a more natural elevation gradient in wetlands to allow a greater diversity of native saline plant species, including special-status species, that are adapted to different elevations and provide a broader range of habitats for wildlife (7)			Increase in number of wetland patches with a natural elevation gradient to upland areas due to CALFED actions	**A-4 M-3**	* Consider not just the number of patches but include a factor that allows monitors to assess the acreage of tidal wetlands with adjacent upland transition or escape cover. Perhaps an index that displays acreage of adjacent upland transition habitat divided by the acreage of tidal wetlands could be developed and used. * too vague. perhaps natural connectivity to upland sites is better. see Goals Project report.	The phrasing of this attribute is awkward. The difference between the CALFED action and what is monitored needs to be clearer and more information presented under the rationale column. Consider merging 3.13 with 3.4 "topographic complexity & tidal channels: patches with marsh pannes, ponds, complex channel networks". Levees also affect the ability of the marsh plain to keep up with sea level rise, since the marsh is blocked from migrating landward.
3.14	ACTION: Control efforts for water hyacinth	ERPP: Eradicate water hyacinth… (7)			Number and effectiveness of control efforts for water hyacinth	**A-4 M-3**	* A simple measure of areal extent of water hyacinth by geographic region could be used. * distribution of water hyacinth is a measure of effectiveness	This should be a general action category of weed control efforts rather than just focusing on one specific weed. Boating survey reports should be included here. 3.14 and 3.15 "Control non-native invasive plants in existing salt marshes" should be combined.
3.15	ACTION: Control non-native invasive plants in existing salt marshes	MSCS: Control non-native invasive plants in existing salt marshes where non-native plants have degraded habitat quality and in salt marshes restored under the ERP (9)			Number and effectiveness of control efforts for non-indigenous plants due to CALFED actions	**A-4 M-2**	* A simple measure of areal extent of non-indigenous plants, by species, by geographic region could be used. * too vague	
		MSCS: Control and reduce populations of non-native marsh species with potential effects on soft bird's beak and potential soft-bird's beak habitat (9)					* A simple measure of areal extent of non-indigenous plants, by species, in areas with soft bird's beak and Suisun thistle could be used. * too vague	

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3.16	ACTION: Create unvegetated, exposed substrate at tidal margins of restored and created tidal fresh emergent wetland and riparian habitat	MSCS:…create unvegetated, exposed substrate at tidal margins of restored and created tidal fresh emergent wetland and riparian habitat to benefit delta mudwort (9)			length of unvegetated, exposed substrate at tidal margins of fresh emergent wetland and riparian habitats	**A-6 E-1**	* perhaps not a regional parameter	
					distribution of delta mudwort	**A-7**		
3.17	ACTION: Incorporate sufficient edge habitat to support Mason's lilaeopsis in levee setback and channel island habitat restoration designs	MSCS:…incorporate sufficient edge habitat to support Mason's lilaeopsis in levee setback and channel island habitat restoration designs (9)			length of edge habitat along channels and channel islands capable of suppporting Mason's lilaeopsis	**A-5 M-1 E-1**	* too vague	
					distribution of Mason's lilaeopsis	**A-7**		
FAUNA (ERP Strategic Objectives 1.3, 3.3, 4.1, 4.4, 5.6, 5.7, 6.1)								
3.18	STATE: Mammals	What are the status and trends of MSCS mammals in tidal wetlands? CALFED does not have specific objectives for monitoring mammal communties other than MSCS species such as Suisun ornate shrew, San Pablo California vole, and salt marsh harvest mouse. Small mammals can be good indicators for patch quality since they have small ranges and little ability to escape site pressures.	MSCS species indices of abundance or presence/absence	**A-6**	MSCS species indices of abundance or presence/absence	**A-6**	* abundance and distribution (use maps to record monitoring at key sites) more sites for presence/absence. Use CNNDB.	Presence/absence is not very useful for monitoring birds or any of the invertebrates. Use relative abundance. It was recognized that presence/absence is useful for regulatory purposes or rare species like the giant garter snake. The Goals Project has identified some key indicators. 7-9 indicator species per habitat can be used as a surrogate for biodiversity
3.19	STATE: Native anurans (frogs & toads)	What are the status and trends of MSCS native anurans in tidal wetlands? There are few native anurans in freshwater tidal wetlands in large part because of the presence of bullfrogs and predatory fish.	MSCS species indices of abundance or presence/absence	**A-7**	MSCS species indices of abundance or presence/absence	**A-7**		<see 3.2>
			presence/absence of deformities	**A-7**	presence/absence of deformities	**A-5 M-1 E-1**	* May not be informative on a regional scale * for regional level, need to quantify better	
			Presence/abundance of non-indigenous frogs such as bullfrog	**A-7**	Presence/abundance of non-indigenous frogs such as bullfrog	**A-5 M-1 E-1**	* May not be informative on a regional scale * for regional level, need to quantify better	

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3.20	STATE: Reptiles	What are the status and trends of MSCS reptiles in tidal wetlands? CALFED does not have specific objectives for monitoring reptile communties other than MSCS species such as the western pond turtle and giant garter snake.	MSCS species indices of abundance or presence/absence	**A-6**	MSCS species indices of abundance or presence/absence	**A-5**		<see 3.2>
3.21	STATE: Waterfowl	What are the status and trends in waterfowl communities in tidal wetlands? The status of waterfowl directly relates to a CALFED objective.	Species richness	**A-6**				A category of "passerines & rails" should be added. Drop "neotropical migratory birds" but keep "raptors" as its own category. The science-NCCP interface must be invented. The question was raised about whether the MSCS "R" and "r" species have the first priority for management? Managing exclusively for these species can have negative impacts on shorebirds. Converting diked wetlands to tidal wetlands can have a negative effect on waterfowl. It was pointed out that the ERPP tried to build in actions to allow self-mitigation in those cases where an action would benefit one species while negatively impacting another species. This must be included in the conceptual framework so that redirected effects on other ERPP species are addressed. The National Academy of Sciences has a discussion on balancing tradeoffs between species. There should be an effort to monitor the prey and predators of these birds and not just the non-indigenous predators.
			Key indicator species indices of abundance or presence/absence	**A-6**	Winter Waterfowl abundances for key species	**A-6**		
			sensitive species indices of abundance or presence/absence	**A-6**	sensitive species indices of abundance or presence/absence	**A-6**		
					Extent & distribution of habitats preferred by	**A-5 M-1**		
					disease outbreaks in region	**A-5 M-1**		
					Harvest reports by species	**A-5 E-1**	* already collected by county	
3.22	STATE: Wading birds	What are the status and trends in wading bird communities in tidal wetlands? This question relates to a CALFED objective. Although patch measures of species diversity, key indicator species, etc. can be measured, across the region, location and size of nesting colonies is essential.	Species diversity, richness, eveness;	**A-7**	Number, location and size of nesting colonies	**A-7**	* type of diversity?	
			Key indicator species indices of abundance or presence/absence	**A-6 M-1**			* be clear about difference between indicator and sensitive species. Indicator of what?	
			sensitive species indices of abundance or presence/absence	**A-6 M-1**			* be clear about difference between indicator and sensitive species. Indicator of what?	
			Previously unreported species observed in area	**A-5**				
3.23	STATE: Shorebirds	What are the status and trends in shore bird communities in tidal wetlands? This question directly relates to a CALFED objective. Measuring status and trends in shorebirds can be difficult since they are affected by many factors outside of the ERP focus area.	Species diversity, richness, eveness;	**A-7**	Species diversity, richness, eveness;	**A-6**		
			Key indicator species indices of abundance or presence/absence	**A-6 M-1**	Key indicator species indices of abundance or presence/absence	**A-5 M-1**	* be clear about difference between indicator and sensitive species. Indicator of what?	
			sensitive species indices of abundance or presence/absence	**A-6 M-1**	sensitive species indices of abundance or presence/absence	**A-5 M-1**	* be clear about difference between indicator and sensitive species. Indicator of what?	
					Extent & distribution of habitats preferred by shorebirds	**A-5 E-1**		

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3.23 cont.		However coordinating with the current regional shorebird surveys is advisable.	Previously unreported species observed in area	**A-7**	Previously unreported species observed in area	**A-5**		Ravens are a native species which may be at an artificially high level due to human activites.
3.24	STATE: Other birds (neotropical migratory, raptors, etc)	What are the status and trends in other bird communities in tidal wetlands?	Species diversity, richness, eveness;	**A-6**	Extent of vegetation communities / habitats	**A-4 M-1 E-1**	* is confusing	Shorebirds – concern was raised about the response of shorebirds to non-indigenous invertebrates, i.e. potamocorbula. So maybe key indicator prey species for birds could be tracked.
			Key indicator species indices of abundance or presence/absence	**A-5 M-1**			* be clear about difference between indicator and sensitive species. Indicator of what?	
			sensitive species indices of abundance or presence/absence	**A-5 M-1**			* be clear about difference between indicator and sensitive species. Indicator of what?	
			Previously unreported species observed in area	**A-6**				
3.25	STATE: Terrestrial invertebrates	Although status and trends in terrestrial invertebrates can show early response to pressures and actions, at a local level, what should be recommended for monitoring is unclear.	Taxa richness, use a suitable diversity index, and measure biomass. Measure variables in water such as salinity and pH.	**A-1 M-1**			* What are the sensitive species?	
3.26	STATE: Benthic invertebrates	What are status and trends in benthic invertebrates in tidal wetlands? Benthic invertebrates provide a useful link between the terrestrial and aquatic monitoring program elements. They also show early response to changes in water quality and contaminants .	Taxa richness, Shannon diversity index, ept taxa, ept index, Modified Hilsenhoff Biotic Index (HBI), Percent Dominant Taxon (PDT)(22)	**A-5 M-1**		**M-1**	* Report data on a regional basis as well * choose a standard diversity index * narrow down * There have been (apparently) no efforts or programs to asses the fauna of either diked or tidal wetlands. Assuming this is necessary (and I do), some effort needs to be made at once, in order to establish a baseline condition. If possible, such a baseline condition should be defined by themost pristine such habitat available (if any). This may require several such "pristine" habitats, located in areas that are under different salinity/vegetation zone/elevation/water quality/ or other influences. If there are no "pristine" conditions, then perhaps it is a matter of choosing habitats at random, with these representing separate known influences. The monitoring baseline should establish over ime the usual inhabitants of these habitats. Modifictions to some of these habitats to mre natural conditions may result in a more diverse community.	Add “abundance of introduced invertebrates”

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3.26 Cont.							Monitoring elements: all these listed seem to be borrwed from the California Bioassessment Protocol -- a system designed to grade the goodness of WADEABLE TROUT STREAMS: the EPT measures and HBI do not apply to wetland habitats (EPT refers to aquatic insect orders which will be rare or nonexistent in tidal wetlands, i.e. ephemeroptera, plecoptera, trichoptera). The useful measures are SPECIES richness and percent dominant SPECIES (not TAXA richness which is meaningless). The appropriate species diversity index is that of Brillouin (9162), not Shannon-Wiener index (Shannon diversity index is inappropriate for aquatic ecosystems). One possible approach is to somehow determine which members of the community are actually native and track their prograss as modifications are made to the environment.	
			Water temperature, PH, Turbidity, Conductivity, Flow velocity, substrate complexity, canopy cover, Algal community surveys (22)	**A-5 M-1**		**M-1**	* canopy cover and algal surveys are confusing * Report data on a regional basis as well * narrow down	
3.27	STATE: Mosaic of sub-habitats	What are the status and trends in the extent and location of sub-habitats in tidal wetlands? Measuring changes in the extent of habitats is expected to be easier to measure and show less variability than measures of species communities.	Detailed vegetation mapping	**A-5 E-1**	Detailed vegetation mapping	**A-3 M-2 E-1**	* not specific enough	It should be noted that some mammals can effect the physical environment, i.e. muskrats.
			spatial distribution of sub-habitat types	**A-5 M-2**	spatial distribution of sub-habitat types	**A-4 M-2**	* how many subhabitats? Practical?	
			Vegetation Community structure	**A-5 M-1 E-1**		**A-4 E-1**	* not specific enough	
			Presence of Ponds, Pannes, Channels & Mudflats	**A-6 E-1**	Number of patches with presence of ponds and pannes	**A-5 E-1**		

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3.28	STATE: Patch size	How many patches of tidal wetland habitat are there that are large enough to support the full range of tidal wetland processes and MSCS species? i.e. > 1000 acres	Patch size	**A-3 E-1**	Patch size distribution	**A-3 M-1**		
					Number of patches > 1000 acres	**A-3 E-1**		
			presence of species requiring larger patch sizes (I.e. >1000 acres)	**A-4 M-1**	<Number of patches with species present that require large patch size>	**A-4**		
3.29	STATE: Connectivity between patches & groups of patches	What is the status of connectivity among tidal wetland habitat patches? "Connectivity" is relative to the dispersal abilities of species. Barriers, distances between patches, availability of dispersal corridors all affect the functional "connectivity" between patches.	distances to nearby similar patches	**A-5**	Distribution of distances to nearest patch relative to dispersal distances of indicator species	**A-3 M-2**	* sounds good but do you have an example? Also sounds like a patch measure * already included	
			Location & types of barriers to movement to other patches	**A-6**	Location & types of barriers to movement between patches	**A-5**		
			Index of movement capability to other patches (existence of migration corridors, lack of barriers, etc)	**A-4 E-2**	Index of movement capability between patches (existence of migration corridors, lack of barriers, etc)	**A-3 E-2**	* redundant, number of barriers seems enough	
			Movement of indicator species into and out of patch	**A-5 M-1**	<Index of movement among patches by an indicator species>	**A-3 E-2**	* too hard regionally, except for a few species	
					Number and location of functionally isolated patches	**A-4 M-1**	* redundant, part of previous mapping effort	
					Location of groups of patches functionally isolated from other groups of patches	**A-4 M-1**	* redundant, part of previous mapping effort	
3.30	STATE: Connectivity with upland habitat	How much of tidal wetland habitat has sufficient connectivity with upland habitat? Small mammals, reptiles, and some birds require transitional habitat to upland areas as high water refugia.	Connectivity level of patch between low marsh, high marsh, and upland habitat areas (preferably transitions should have low-angle upland slope at the upper edge of marshes and be at least 0.25 miles in width and have adequate vegetative cover for species to avoid predations while seeking refuge from flooding) (9)	**A-4 M-1**	Number, extent, & location of tidal wetland habitat patches with low-angle upland slopes at the upper edge of marshes to provide sufficient wetland to upland transition habitat zones. Transition habitat zones should be at least 0.25 mile in width. (9)	**A-3 M-1 E-1**	* too detailed at a regional level	

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3.30 Cont.					Number, extent & location of tidal wetland habitat patches with no real connectivity with upland habitat rendering it of low quality to much terrestrial fauna.	**A-4 M-1**		
			Land use practices in the transition zones (grazing,	**A-4 M-1**	Land use practices in the transition zones (grazing,	**A-3 M-1**	* somewhat redundant with previous indicators	
			<presence of species that require connectivity with upland habitat>	**A-1 M-1**	<number of patches with species present that require connectivity with upland habitat>	**A-1 E-1**		
3.31	PRESSURE: Some adjacent land use practices	Adjacent land use practices can either provide additional habitat for wildlife species or provide additional pressures. Urbanization increases affects due to non-indigenous pets, recreational disturbance etc.	type of adjacent land use	**A-4 M-1**	mapping of adjacent land use to tidal wetlands	**A-4 M-1**		
			utility as habitat for tidal wetland species	**A-3 E-1**	utility as habitat for tidal wetland species	**A-3 E-1**		
			wildlife friendly agricultural practices	**A-3 M-2**	wildlife friendly agricultural practices	**A-3 M-2**	* more specificity is needed. How is it quantified	
			presence of buffer zone of grassland and/or wetland habitat from other land uses	**A-3 M-2**	presence of buffer zone of grassland and/or wetland habitat from other land uses	**A-3 M-2**	* more specificity is needed. How is it quantified	
			distance to urban areas, roads	**A-4 M-1**	location of urban areas, roads	**A-4 M-1**		
3.32	PRESSURE: Local disturbance (mosquito control, hyacinth control, levee maintenance activities, boat wakes)	Local disturbances to fauna are covariates for measures of animal communities	?				* important but difficult to track	
3.33	PRESSURE: Predation by non-indigenous animals - foxes, rats, feral cats & dogs	Predation by non-indigenous animals - foxes, rats, feral cats & dogs is an important pressure on many MSCS species and tidal wetlands in general.	Index of abundance of introduced foxes	**A-8**	Location of areas where introduced foxes are considered a problem	**A-6 M-1 E-1**	* too vague	See above. Predation should be expanded to include native predators.
			Index of abundance of Norway rats	**A-8**	Location of areas where Norway rats are considered a problem	**A-6 M-1 E-1**	* too vague	
			Index of abundance of feral cats	**A-8**	Location of areas where feral cats are considered a problem	**A-6 M-1 E-1**	* too vague	

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3.33 Cont.			Presence of California clapper rail, blackrail or salt marsh harvest mouse habitat	**A-7 M-1**	Proximity of problem areas to suitable habitat for California clapper rail, California black rail, and Salt Marsh Harvest Mouse	**A-6 M-1**		
3.34	PRESSURE: Introduction of red-eared slider	Introduction of red-slider turtles may create problems for native turtles in the future. Monitoring the presence and spread seems appropriate	Presence/absence of red-eared slider during reptile sampling	**A-8**	Location of areas where red-eared slider has been observed	**A-7 E-1**	* combined into location of identified problem/exotic species	
3.35	PRESSURE: Predation by introduced bullfrogs	Presence of introduced bullfrogs is directly related to the disappearence of native frogs.	Presence/absence of of bullfrog in ponds & pannes during amphibian sampling	**A-7 M-1**	Location of areas where introduced bullfrog has been observed	**A-7 E-1**	* maybe location where they do not occur	
3.36	PRESSURE: Contaminants - Selenium, Mercury, Other	Measuring aquatic toxicity should provide earlier warning and response to changes in contaminant levels than measures in the terrestrial system. We expect that aquatic toxicity measures will be more fully detailed in the aquatic monitoring plan.	Aquatic toxicity measures (fish tissue, benthic invertebrates communities, algal communities)	**A-5 M-1**	Aquatic toxicity measures (fish tissue, benthic invertebrates communities, algal communities)	**A-6 M-1**	* Add location of areas with high levels of contamination	
		Restored wetlands may increase mercury methylation, affect fish, waterfowl, and humans consuming contaminated animals			Concentrations of mercury in waterfowl tissue relative to human health concerns	**A-6 M-1 E-1**	* Has nothing to do with ecological restoration - is a human health problem	
3.37	ACTION: Control non-native invasive plants in existing salt marshes	MSCS: Control non-native invasive plants in existing salt marshes where non-native plants have degraded habitat quality and in salt marshes restored under the ERP (9)			Location, status, & effectiveness of control efforts for non-indigenous plants	**A-8**	*Shouldn't wait for invasive plants to degrade habitat quality before instituting control measures.	
3.38	ACTION: Reduce red fox, Norway rat, and feral cat populations	ERPP: Reduce red fox, Norway rat, and feral cat populations in and adjacent to habitat areas suitable for California clapper rail, California black rail, salt marsh harvest mouse & (other species) (7)			Location, status, & effectiveness of control efforts for non-indigenous predators	**A-5 M-2**	* somewhat redundant with previous indicators * practical? * how is effectiveness defined?	

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3.39	ACTION: Reduce populations of bullfrogs	ERPP: Reduce populations of bullfrogs (7)			Location, status, & effectiveness of control efforts for introduced bullfrogs	**A-4 M-2 E-1**	* May not be informative on a regional scale * somewhat redundant with previous indicators * practical? * how is effectiveness defined?	
3.40	ACTION: Buy-back program for red-sliders	ERPP: Implement buy-back program for red-sliders (7)				**M-1**	Add under regional "Number of red-eared sliders returned per unit of public outreach e. g. newspaper ads or public service announcements"	
3.41	ACTION: Modify vegetation management practices along levees	ERPP: where consistent with flood control objectivies, modify vegetation management practices along levees to allow wetland vegetation to reestablish naturally (7)			Location, status, & effectiveness efforts to modify vegetation management practices along levees	**A-4 M-2**		
3.42	ACTION: Restore a more natural elevation gradient in wetlands	ERPP: Restore a more natural elevation gradient in wetlands to allow a greater diversity of native saline plant species, including special-status species, that are adapted to different elevations and provide a broader range of habitats for wildlife (7)			Location, status, & effectiveness efforts to create a more natural elevation gradient in tidal wetlands	**A-4 M-1 E-1**		
3.43	ACTION: Improve wetland to upland transitional habitat	MSCS: Improve wetland to upland transitional habitat (9)			Location, status, & effectiveness to improve the quality of wetland to upland transitiional habitat	**A-5 E-2**	* confusing and redundant	
3.44	ACTION: …design and manage wetland habitat restorations to provide suitable nesting and foraging habitat conditions for dependent species	MSCS: …design and manage wetland habitat restorations to provide suitable nesting and foraging habitat conditions for dependent species (9)			Location, status, & effectiveness of efforts to design and manage wetland habitat restorations to provide suitable nesting and foraging habitat conditions for dependent species	**A-4 E-2**	* use species nesting indices instead	

TABLE TW3. Summary of Comments -- Tidal Wetland Habitat Quality in Support of Biodiversity, including MSCS Species

This table summarizes the Tidal Wetlands workshop comments (8/30/2000) in the same format that participants conducted the review. See Figure 2 for Key.

			Patch / Local Site level		Regional level			
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Evalu-ation**	**Monitoring Element**	**Evalu-ation**	**Pre- and Post- Workshop Comments**	**Comments during workshop**
3.45	ACTION: Improve wildlife friendly agricultural practices in areas near tidal wetlands	ERPP: Improve wildlife friendly agricultural practices in areas near tidal wetlands including * deferring fall tillage until later in year can increase quantity of forage on cornfields for waterfowl and greater sandhill cranes * shallow flooding of seasonal croplands in fall/winter can greatly increase the availability of forage for wintering waterfowl * retaining a percentage of the unharvested crop in the agricultural field would enhance the value of flooding (7)			Location, status, & effectiveness of efforts to improve wildlife friendly agricultural practices near tidal wetlands	**A-5** **M-1**	* clarify	
3.46	ACTION: Reduce the effects of boat wakes in sensitive habitat areas	ERPP: Reduce the effects of boat wakes in sensitive habitat areas by excluding boats from certain areas at certain times and establishing maximum speed limits (7)			Location, status, & effectiveness of efforts to control boat wake erosion	**A-4** **M-1**	* redundant	
3.47	ACTION: Reduce in contaminant loading	ERPP: Reduce the amount of contaminants flowing into the Bay-Delta and subsequently absorbed by Bay-delta sediments (7)			Location, status, & effectiveness of efforts to reduce contaminant loading	**A-4** **E-1**	* redundant	

WORKSHOP 2
Habitats of freshwater and riparian wetlands of the Central Valley (Sept. 7, 2000)

WORKSHOP 2 OVERVIEW

Participants raised questions about how the monitoring elements would be prioritized, how CALFED would relate to existing programs, and how TAMP would be integrated with the aquatic monitoring plan. They also pointed out that what habitat quality is varies depending on the species involved. In general comments seemed to request more detail on a lot of the monitoring elements and the need for inclusion of spatial and temporal scales was stressed.

Participants discussed the different ways an efficient monitoring program could be developed, e.g., by using a network of intensive and extensive monitoring sites similar to the CPIF program, or by taking advantage of monitoring for MSCS species when it allows gathering of additional community information at little additional cost. Although using habitat monitoring as a surrogate for species monitoring is another way of cutting costs, there are only a limited number of good species-habitat models. Many more would need to be developed.

Considerable advice was given on refining the monitoring elements in Tables FR1 and FR3. The section on physical sustainability and maintenance of habitats (Table FR1) needs further refinement and some workshop participants agreed to be available for follow-up questions. The workshop participants were largely in agreement with Table FR2 and did not discuss it in detail at the workshop.

WORKSHOP 2 – GENERAL DISCUSSION

1) Prioritizing the monitoring recommendations

Questions were raised about how this list of monitoring elements would be prioritized and what the budget would be. This sounds like a nice list, but the difficult decisions will come when a budget is given.

Larry Smith pointed out that a critical question CALFED will ask is “How will CALFED affect it?” and “How will it affect CALFED?”

The list of MSCS species/ celebrity species will likely change. The monitoring plan needs to provide continuity behind them.

2) Habitat Quality
The term habitat quality is ambiguous because the definition of “quality” depends on the species looked at.

The book “Predicting Species Occurrences” by Mike Scott will be published in December by Island Press. It has a good section on nomenclature.

3) Dependence on existing programs
The question was raised about whether CALFED will fill in if any of the existing monitoring programs drop out? CALFED may be able to provide augmentation funding, but the way CALFED documents are written, current programs can not stop funding monitoring simply under the assumption that CALFED will pick it up. However, the rationales for all monitoring recommendations must be expanded so that it is clear why each recommendation is needed and any consequences if it is not included in the program.

Retain monitoring recommendations even if other programs are monitoring them.

4) Relationship to Aquatic Monitoring Plan
Floodplains are dry part of the year and wet part of the year. Clarification of the link to the aquatic monitoring plan is necessary.

Table FR1. Summary of Comments -- Freshwater & Riparian Wetland Wetland Maintenance and Sustainability due to Physical & Ecological Processes

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			Patch / Local Site		Regional level			
No.	State, Pressure or Action Attribute	Rationale	Monitoring Element	Evaluation	Monitoring Element	Evaluation	Pre- and Post- Workshop Comments	Comments during workshop
GENERAL COMMENTS								
* (Post-Workshop) A general comment I have is that it seems very premature to drop any elements at this point. If folks think these things need to be addressed, they should remain on the list (or added) regardless of the feasibility, cost, or political correctness. If there are issues or elements that need to be addressed, they should be identified and documented now and not dismissed because of feasibility, cost, or political reasons. Let those decisions be made elsewhere at those levels. I believe it is our responsibility to identify all of the elements that need to be addressed and not make those determinations at this stage. I think there are too many unknowns as far as some of the other programs identified in the table you provided. While there is a lot work being conducted throughout the system, I do not think there is much information available from a lot of those programs. An example is the discussion about contaminants. Many folks said that was the EPA's responsibility, when in fact, to the best of my knowledge, they do not actively go out and collect tissue samples and set health warnings. They have a few small data sets and do not actually monitor the levels. The monitoring they do is focused in areas with known problems such as the agriculture bypasses/drains in the San Joaquin Valley. While this might ultimately be the responsibility of some other agency, we need to make sure these elements are actually being addressed at a level that benefits our program. * Need to monitor changes in waterways/wetlands due to excessive siltation caused by infestation of nonnative plants. * It seems we are missing a critical element: weather. Data such as rainfall amount, frequency, duration, distribution; snowfall distributiion, amounts and water content; insolation (has an effect on plant species); evapotranspiration; temperature highs, lows and means (hourly gradients would be even better); and several other weather related phenomena will be needed to form a backdrop for these other items. Perhaps they will be included with the landscape scale items? * (Comment at Workshop) The response to climate change is essential to assessing changes in the system. We are now seeing changes in the Sierras.							
HYDROLOGY - RIVER FLOW, FLOODS, FLOODPLAIN INUNDATION, GROUNDWATER TABLE (ERP Strategic Objectives 2.1, 2.5, 2.6, 2.8, 4.1, 4.2, 4.5)								
1.0	STATE: Variable flows	What is the river/stream hydrograph compared with the natural hydrograph? Deviations from the natural hydrograph affect vegetation establishment and maintenance and groundwater levels. It is also an important covariate for understanding floodplain inundation and channel migration processes.	*Magnitude, timing, and variability of flow in rivers compared with historic natural hydrograph (14, 8, 11, 1)*	**A - 7 M - 1**	*Magnitude, timing, and variability of flow in rivers at tributary mouths compared with historic natural hydrograph (14, 8, 11, 1)*	**A - 7 M - 1**	*What is the definition of a natural hydrograph in a greatly modified stream? The addition of dams, rip-rap, channelization, etc. must make this definition difficult to determine. *Attribute: Perhaps this should just be called "Floodplain Hydrology" *The term "hydrograph" is unclear here. Do you mean unit hydrograph? Annual hydrograph? Need to develop an Index of Hydrologic Alteration (being done, I presume) for each tributary and for reaches of the mainstems. *Need more specific measurement descriptions. All need to agree on a definition of how "historic hydrograph" will be derived. Also should include total annual discharge.	IHA is needed but really for the aquatic monitoring plan.
			Seasonal shift in stream level (min. vs. max.) (14)	**A - 4 E - 4**			*Combine with the one above *Eliminate. If you want to consider 'how", I recommend the Nature Conservancy's "Indicators of Hydrologic Alteration." *No need to break this out separate. This is covered in the above assessment of hydrologic alteration. *Not sure how valuable this is, if it is just min/max comparisons.	

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No.	State, Pressure or Action Attribute	Rationale	Monitoring Element	Evaluation	Monitoring Element	Evaluation	Pre- and Post- Workshop Comments	Comments during workshop
1.0 cont.			water year	A - 5 M/E - 2	water year	A - 5 M/E - 2	*Seems redundant with first element. This seems more relevant to the "how" question for monitoring *Water year is not described in the glossary, so I assume it refers to the annual season of precipitation and coincides with either the State or Federal fiscal year. *"Water year" itself can be misleading. It's more important to document amount and seasonal distribution of precipitation/runoff	
1.1	STATE: Infrequent Channel Resetting Floods (23)	Are large flow events occurring frequently enough to cause large changes in channel migration and the associated diverse array of habitats associated with those changes? Large flow events cause major changes in channel migration (bend cut-throughs, oxbow lakes,etc) which are associated with a diverse array of habitats years later.	Occurrence of extreme flood events, capable of major changes in channel and river course	A - 3 M - 2 E - 1	Occurrence of extreme flood events, capable of major changes in channel and river course	A - 3 M - 2 E - 1	*Need to define major changes and determine what constitutes an extreme flood event (5, 10, 100-yr. Flood?) *monitor only "major changes"? How to define "major change"? *This information is redundant if an IHA is developed. This overall category (1.1) should be folded into 1.0. *The inter-flood regime is at least as important as major events in determining channel shape. Need to include inter-flood flow/sediment transport in this context.	
			Major changes in channel meander & morphology	A - 3 M - 2 E - 1	Major changes in channel meander & morphology	A - 3 M - 2 E - 1	*Need to define major changes and determine what constitutes an extreme flood event (5, 10, 100-yr. Flood?) *This is irrelevant for some important streams due to channel stabilization. *Presumably planform geometry will be monitored elsewhere.	
			distribution and extent of floodplain habitats (11)	A - 5 E -1	*distribution and extent of floodplain habitats (11)*	A - 5 E -1	*Bottom line to be monitored *The monitoring of distribution and extent of floodplain habitat should be covered under a different category	

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No.	State, Pressure or Action Attribute	Rationale	Monitoring Element	Evaluation	Monitoring Element	Evaluation	Pre- and Post- Workshop Comments	Comments during workshop
1.2	STATE: Floodplain inundation, duration, frequency and seasonality	What is the extent, frequency, duration, timing, and variability of floodplain inundation and its affect of floodplain habitats? Floodplain inundation is an important covariate in determining vegetation community composition and structure	Acreages of floodplain inundation duration, frequency, depth, and seasonality of woody riparian, freshwater marsh, seasonal wetlands, and associated upland habitats based on synthesis from detailed topography (both channel and floodplain) (1, 11))	A - 7	Acreages of floodplain inundation duration, frequency, depth, and seasonality of woody riparian, freshwater marsh, seasonal wetlands, and associated upland habitats based on synthesis from detailed topography (both channel and floodplain) (1, 11))	A - 6 M - 1	*Good *Geomorphology and soils are a potentially useful fingerprint to recent and past meander amplitude and frequency, therefore distribution and extent of various geomorphic surfaces and soil types should also be assessed. *This is primarily a modeling exercise, with incorporation of GIS information. The Corp's Comp Study is key to the success of this effort. *Attribute: Perhaps this should just be called "Floodplain Hydraulics" *Need a description of velocity and velocity gradients on flood plains, particularly in areas where CALFED work has taken place.	
					Minimum surface area of floodplain inundated at least once every two years and every ten years (14, 11)	A - 5 M - 1	*This seeems somewhat redundant. Isn't this a refinement of the first component? *This is based on a periodic recalculation of flood frequency (affected by changes that should show up in IHA), integration of topographic and land use changes, all incorporated in a hydraulic model. This is a pretty tall order.	
			distribution and extent of floodplain habitats (11)	A - 6	*distribution and extent of floodplain habitats (11)*	A - 6	*Redundant?	
			presence of permanent open water (e.g. sloughs, embayments, oxbows, side channels, borrow pits, ponds) (1)	A - 6 E - 1	presence of permanent open water (e.g. sloughs, embayments, oxbows, side channels, borrow pits, ponds) (1)	A - 6 E - 1	*Redundant?	

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No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Evaluation**	**Monitoring Element**	**Evaluation**	**Pre- and Post- Workshop Comments**	**Comments during workshop**
1.3	STATE: Groundwater table (11,19)	What is the groundwater depth relative to the habitat type? Groundwater depth and variability is an important determining factor in vegetation communities structure and composition in a given patch.	depth to groundwater table (11)	**A - 5**	acreages based on elevation difference between ground surface and average low-flow water surface in areas of woody riparian, freshwater marsh, and associated upland areas (1)	**A - 3 M - 2**	*I do not know enough about this to comment adequately. It would have been very helpful to have the references to look at before commenting. *Modify? Not sure if I understand why this should be linked to habitat types regionally but not locally. *The distribution of these habitats is also a result of soil types and associated geomorphology. *The description of the regional monitoring element is confusing. Not clear what it is that you are trying to accomplish. The most effective tool is to develop and maintain a regional groundwater model. Habitat models can be overlain on this model to address regional changes in conditions. *Modify rationale and patch element to include, SEASONAL groundwater depth	The issue of the depth to the groundwater table is vital and is an important predictor of vegetation. Jeff Mount volunteered to help us develop better regional groundwater monitoring elements. The current regional monitoring element is poor. The term “average” should be replaced with “within the range of natural variability”
			soil moisture levels laterally from banks (11)	**A - 5**			*I do not know enough about this to comment adequately. It would have been very helpful to have the references to look at before commenting.	
			infiltration rate (11)	**A - 4 E - 1**			*This is too hard to monitor and not worth the effort.	
			distribution and extent of floodplain habitats (11)	**A - 5 M - 1 E - 1**	*distribution and extent of floodplain habitats (11)*	**A - 5 M - 1 E - 1**	*Redundant with previous component *…and geomorphic surfaces and soil types.	
1.4	PRESSURE: water management	Water management changes including reservoir releases, water diversions and return flows, water transfers and groundwater pumping affect the amount timing and variability of flows throughout the season from the historical hydrograph. Flows and groundwater pumping can also affect the depth to the groundwater table which in turn affect riparian vegetation.	*Magnitude, timing, and variability of flow in rivers compared with historic natural hydrograph (14, 8, 11, 1)*	**A - 4 M/ E - 2**	*Magnitude, timing, and variability of flow in rivers at tributary mouths compared with historic natural hydrograph (14, 8, 11, 1)*	**A - 4 M/ E - 2**	*I am concerned about how one goes about determining what the historic natural hydrograph is in a grossly altered landscape. Even if one could determine the natural hydrograph, it is not clear that you would want to return to that or even use it for a reference. *Again, I find the redundancy awkward. this isn't wrong, it is just redundant. *Presumably this is the same IHA as in 1.0. *At what scale are these measurements to be taken? The smaller the scale, the more necessary it will be to have local cooperation. Could be tough when it comes to "metering" groundwater pumping and diversions.	Measuring “groundwater pumping” is not practical and not permissible under current laws. An indirect measure would be groundwater well levels, but just use existing data and existing agency efforts. Currently there are also a lot of groundwater models and CALFED could consider supporting further development.

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No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Evaluation**	**Monitoring Element**	**Evaluation**	**Pre- and Post- Workshop Comments**	**Comments during workshop**
			depth to groundwater table (11)	**A - 6**	*depth to groundwater table (11)*	**A - 5**	*Will this be a regional average? *Modify element to SEASONAL depth to groundwater table	
					releases from dams	**A - 5**	*Dam releases have effects and can be monitored for individual patches. *Modify element to, Flow release operations on major dams	
			water diversions on ~~certain~~ tributaries & return flows	**A - 4 M- 1**	water diversions on ~~certain~~ tributaries & return flows	**A - 4 M - 1**	*Not entirely clear what this means that is any different than above	
			groundwater pumping	**A - 6 E -1**	groundwater pumping	**A - 6 E -1**	*Doubtful that this can be achieved in any meaningful way in our lifetimes… * The discussion on 1.4 and the recommendation to remove it because it is not feasible seems wrong to me. I realize that the info that the Conjunctive Use Program is collecting is not directly applicable to these efforts but what if additional wells were put in along the rivers edge and in the floodplain? While we might not be able to figure out what the exchange is from the River to the Floodplain, we might be able to start working towards answering those questions with additional wells.	
			water transfers	**A - 6**	water transfers	**A - 6**		
1.5	ACTION: provide for more natural stream and river flows	Provide for more natural stream and river flows	*Magnitude, timing, and variability of flow in rivers compared with historic natural hydrograph (14, 8, 11, 1)*	**A - 5 E- 1**	*Magnitude, timing, and variability of flow in rivers at tributary mouths compared with historic natural hydrograph (14, 8, 11, 1)*	**A - 5 E- 1**	*Redundant with 1.0	
FLOODPLAIN TOPOGRAPHY AND CHANNEL MIGRATION (ERP Strategic Objectives 2.3, 2.6, 2.8)								
1.6	STATE: Floodplain extent & topography	What is the floodplain topography? Topography provides an important covariate to explain the extent of floodplain and the distribution of habitats.	floodplain topography	**A - 5 M - 1 E - 1**	regional topography	**A - 5 M - 1 E - 1**	*Too vague *From a practical standpoint, this will be hard to quantify in a useful and accurate manner. More useful information about floodplain topography, and its influence on communities, will come from land use/land conversion layers. Depending upon historic and present land use, this will dictate the state of alteration of the floodplain.	Floodplain topography is not really a stand-alone attribute. It is done for restoration planning or for computer modeling or for levee maintenance. The Comprehensive Review Study has taken topography in Delta and Sacramento Rivers at 2' contour levels, but it is unclear if this data will be generally available. Its possible that regional topography could be

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No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Evaluation**	**Monitoring Element**	**Evaluation**	**Pre- and Post- Workshop Comments**	**Comments during workshop**
			mean width of available meander corridor (11)	**A - 5** **E - 1**	mean width of available meander corridor (11)	**A - 5** **E - 1**	*More specific *Not clear that this tells us anything useful or not. Taken alone, width of the meander corridor is meaningless. Need to compare this to something (such as historic vs present condition) *Should also include floodplain soils analysis, particularly regarding grain size and distribution (horizontal and vertical)	taken as a single snapshot to support restoration planning. But it isn't a regional monitoring element. "mean width of available meander corridor" needs work. Is this the direct meander belt? Is this the extent of the floodplain?
			distribution and extent of littoral zone (11)	**A - 5** **E - 2**			*More specific *difficult to monitor	
			distribution and extent of floodplain habitats (11)	**A - 5** **M - 1** **E - 1**	*distribution and extent of floodplain habitats (11)*	**A - 5** **M - 1** **E - 1**	*Redundant *…and distribution of floodplain soils.	
1.7	STATE: Channel morphology & migration & effect on habitats	Is natural channel meander occurring and resulting in a natural succession of habitat types? Channel migration is a key process in creating a mosaic of habitats across the landscape	mapping of channel morphology -- meander, branching, pool-riffle-run ratios	**A - 4** **M - 3**	mapping of channel morphology -- meander, branching, pool-riffle-run ratios	**A - 5** **M - 2**	*This evaluation should be as detailed as possible, preferably following USFS Region 5 habitat mapping guidelines or equivalent. *Map channel geology for erosion potential and geologic control (natural hard-points). *Presumably most of this will be covered by monitoring in other sections. Should focus on those aspects of channel morphology that affect floodplain habitats: channel migration, abandonment, avulsion, cut-off. Also, missing a key element here: channel cross section change. Important to document status and trends of channel cross sections as an indicator of existing or potential connectivity between rivers and floodplains (channel incision disconnects rivers from floodplains) *Suggest "correlation" with habitats rather than "effects." Too complex to attempt direct cause and effect at a site between changes in morphology and changes in vegetation.	"pool-riffle-run ratios" only useful in streams, not rivers Rivers are very diverse in structure, some meander and some don't. some have multiple channels and some don't. Channel Cross-section monitoring is missing. This should be done at gaging and non-gaging stations. Cross-sections give a great deal of information on the condition of the river. lots of historical information available. Under the rational use "natural channel morphology" rather than "meander" For regional monitoring there are a variety of measures… sinuosity, width of meander belt, channel cross-section, branching, etc. However much of the rivers are now leveed and these features are restricted. Monitoring elements should be added regarding habitat and species succession. Jeff Mount volunteered to help develop this section further.
					Percent of river miles exhibiting naturalistic meandering (11)	**A - 5** **M - 2**	*Not sure of the purpose of monitoring "naturalistic meandering." Hard to evaluate what is natural. *Dynamism in river channels is not simply lateral migration of sigle channels ("naturalistic meandering"). Multi-channel systems, particularly anastomosing channels, behave differently. Should acknowledge the range of channel types.	

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			channel migration (bank erosion, sediment deposition	**A - 7**	channel migration (bank erosion, sediment deposition	**A - 7**		
			distribution and extent of floodplain habitats (11)	**A - 6 M/E - 1**	*distribution and extent of floodplain habitats (11)*	**A - 6 M/E - 1**	*Redundant	
1.8	PRESSURE: levees, channel straightening	Straightening of channels and levees eliminate the natural river meander processes and the habitats they support and disconnects the rivers from their floodplains.	width of meander corridor between levees	**A - 5 M - 2**	percent of river constrained by constructed levees (11)	**A - 5 M - 2**	*Not sure how this percentage relates to goals. *Would it also be worth including cross-sectional profile of the channel? Straightened channels are trapezoidal *…and percent of river banks constrained… *Not clear what is meant by % of river constrained by constructed levees. From a floodplain perspective, the most meaningful measure is the % of floodplain disconnected from the 2 , 10 and 20 year flood. *Add to patch element, changes in channel planform, changes in channel cross section	
1.9	PRESSURE: rip-rap and other bank hardening structures	Rip-rap prevents natural channel migration by preventing bank erosion processes and disrupts natural plant community establishment.	length of river banks constrained by rip-rap or other channel hardening structures	**A - 6 M - 1**	length of river banks constrained by rip-rap or other channel hardening structures	**A - 5 M - 2**	*Not sure how this percentage relates to goals. *Would it also be worth including cross-sectional profile of the channel? Straightened channels are trapezoidal	
1.11	ACTION: reconnecting channelized rivers & streams with their historic floodplains	ERPP: reconnecting channelized rivers & streams with their historic floodplains; ERPP: designating, acquiring title or easements for, and deliberately managing river corridor meander zones on appropriate rivers and streams throughout the Central Valley (7)			expansion in potential floodplain due to levee removal/ breaching of dikes	**A - 5 M - 2**	*Doesn't this belong in Form 2, connectivity? *This listing of elements to be monitoring needs expansion and specificity.	Monitoring elements should be added regarding habitat and species succession. In general this should be treated like any other restoration action monitoring. However, setback levees may cause redirected effects such as causing increased pressure on other levees or even increasing flooding downstream depending on whether they are located in the middle or lower part of the watershed. Levees should be setback starting at the bottom of the watershed and then proceeding up the watershed.
1.12	ACTION: setback levees	ERPP: locating setback levees to expand potential riparian floodplain (7)			expansion in potential floodplain due to setback levees	**A - 6 M - 1**	*This listing of elements to be monitoring needs expansion and specificity.	

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1.13	ACTION: expanding capacity of bypasses	ERPP: expanding the storage, detention, and bypass capacity of the Sacramento and San Joaquin river flood control project to allow natural expansion of riparian vegetation within levees and the Sutter and Yolo bypasses (7)			*distribution and extent of floodplain habitats (11)*	**A - 6 M - 1**	*Add "due to bypass expansion"? *need to assess the associated flood frequency, inundation, area and timing associated with these changes	
1.14	ACTION: increase vegetation roughness along levees	ERPP: identifying levee-confined channels and banks where routine vegetation removal by local reclamation districts can be safely discontinued (7)			?	**?**	*Can't comment on a missing element. *Element could be "location(s) of discontinued veg removal on levees"? *Add to Regional level monitoring--location of discontinued, local reclamaion district vegetation removal projects ? *Great bumper sticker: "Don't mess with my Manning's n!"	This is really another redirected effects issue as increased habitat along the levees may change flow through the channel. The term "roughness" is a poor choice of words. This should be changed to "increase in habitat along levees".
1.15	ACTION: reduce bank hardening	ERPP: reduce bank hardening by creating meander zones and widening floodplains ERPP: designating and acquiring "stream erosion zones" to reduce the use of bank riprap and allow greater natural recolonization (7)			location of removed rip-rap and other bank hardening features	**A - 5 M - 2**	*Seems like the monitoring should be of both additional riprapping and removal of this material. *Need to assess channel response to removal of riprap in order to evaluate effectiveness. This will include changes in planform and cross section upstream and downstream of affected reach.	
SEDIMENT SUPPLY, DELIVER, AND MOVEMENT PROCESSES (ERP Strategic Objective 2.5, 2.7)								
1.16	STATE: Sediment supply, delivery, and movement processes	Is the coarse sediment supply to floodplains sufficient to maintain the natural establishment and succession of vegetation? Sediment supply from upper watersheds has been greatly diminished in many tributaries due to dams and gravel mining. [Some of these measures actually relate more strongly to monitoring for salmonids, but we decided to include them anyway].	net change in depth/unit time of unconsolidated sediments (11)	**A - 4 M - 2**	relative amount of sediment supply from ~~various~~ tributaries	**A - 5 M - 2**	*Not being a hydrologist or geomorphologist and without access to the references, comments on this section are difficult to make. *Not clear what is being measured at the patch scale. *Comment on rationale. Note: The bulk of sediment deposited on the flooplains is fine-grained. Coarse sediment (meaning sand-sized material) is confined to the riparian zone. *Depth is not very useful if area/shape is not part of the evaluation. At regional level, what is the "realtive amount" relative to?	Don't use the term "coarse sediment", just use "sediment" Sediment flux is not important for terrestrial plan– leave to aquatic program What is important is the rates and location of sediment deposition and erosion. Monitor the areas, rates, locations, and textures of deposition and areas of erosion. The lateral exchange part maybe should be rephrased since gravel recruitment from bank erosion is important.
			amount of coarse sediment delivered per unit time (11)	**A - 5 E - 2**	*amount of coarse sediment delivered per unit time (11)*	**A - 5 E - 1**	*…from various tributaries? *Again, not clear what is being measured. Is this delivery to the floodplain, channel, both? *In western systems, this may be of limited value, since the systems are so flashy	

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			Patch / Local Site		Regional level			
No.	State, Pressure or Action Attribute	Rationale	Monitoring Element	Evaluation	Monitoring Element	Evaluation	Pre- and Post- Workshop Comments	Comments during workshop
			lateral exchange: river to floodplain (amount and composition) (11)	A - 4 E - 1			*This is a difficult flux rate to measure and may not tell us any more than topography will.	

Table FR1. Summary of Comments -- Freshwater & Riparian Wetland Wetland Maintenance and Sustainability due to Physical & Ecological Processes

This table summarizes the Freshwater & Riparian Wetlands workshop comments (9/7/2000) in the same format that participants conducted the review. See Figure 2 for explanation of table.

			Patch / Local Site		Regional level			
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Evaluation**	**Monitoring Element**	**Evaluation**	**Pre- and Post- Workshop Comments**	**Comments during workshop**
1.16 cont.			interannual comparison of geomorphic features (sand bars, gravel bars, etc.) (11)	**A - 5**			*These are channel features, not floodplain features, with the exception of those areas where high velocity flows are moving across the floodplain	
			substrate type, sediment particle size and distribution within the stream and floodplain (11, 1, 14)	**A - 5 E - 1**			*This is unlikely to tell us very much	
1.17	PRESSURE: Dams blocking sediment from upper watersheds	Dams block sediment supply from watersheds above the dam to areas below the dams	*amount of coarse sediment delivered per unit time (11)*	**A - 4**	*amount of coarse sediment delivered per unit time (11)*	**A - 3 M - 1**	*Suggest sediment pass-through devices on dams where feasible *Again, not clear what is being measured. Is this delivery to the floodplain, channel, both? *I don't understand exactly what monitoring is suggested here	
1.18	PRESSURE: Gravel mining	Gravel mining decreases the amount of gravel supplied to habitats downstream			Location of gravel mining operations	**A - 7 E - 1**	*This should be evaluated as a regional vs local issue on a subwatershed basis	
					tonnage removed	**A - 7**		
NEW	PRESSURE: Need to monitor changes in waterways/wetlands due to excessive siltation caused by infestation of nonnative plants.		Need to monitor changes in waterways/wetlands due to excessive siltation caused by infestation of nonnative plants.	NEW	Need to monitor changes in waterways/wetlands due to excessive siltation caused by infestation of nonnative plants.	NEW		Arundo, spartina, and egeria have large effects on trapping sediment and arundo can cause rapid narrowing of the channel. Perhaps this could be monitored at a few reference sites and then extrapolated to changes occurring elsewhere in the system. Changes can occur the other way also. Planting of juniper stands has been associated with decreases in sediment trapping.
1.19	ACTION: remove small, nonessential dams on gravel-rich streams	ERPP: remove small, nonessential dams on gravel-rich streams (7)			Number and location of dams removed	**A - 8**		
1.20	ACTION: phasing out instream gravel mining	ERPP: phasing out instream gravel mining (7)			Location of instream gravel mining moved out of instream locations	**A - 7**		
1.21	ACTION: artificially maintain sediment supplies, enhance stream meander processes, remove bank protection	ERPP: artificially maintain sediment supplies, enhance stream meander processes, remove bank protection (7)			*amount of coarse sediment delivered per unit time (11)*	**A - 6 E - 1**	*the monitoring element is unlikely to tell us anthing about the action	

Table FR2. Summary of Comments -- Freshwater & Riparian Wetland Habitat Extent & Connectivity

This table summarizes the Freshwater & Riparian Wetlands workshop (9/7/2000) comments in the same format that participants conducted the review. See Figure 2 for table description.
The patch/local site level monitoring was not considered relevant for this section.

No.	State, Pressure or Action Attribute	Rationale	Patch / Local Site Monitoring Element	Regional level Monitoring Element	Evaluation	Pre- and Post- Workshop Comments	Comments during workshop
HABITAT EXTENT (ERP Strategic Objectives 4.2, 4.3, 4.4)							
2.1	STATE: Habitat acreage, linear extent and width, and spatial distribution	What are the status & trends in acreage, linear extent and spatial distribution of riparian and freshwater wetland habitat since the baseline year?		Acreage and location of freshwater marsh, riparian, seasonal wetlands, perennial grassland, and natural upland areas	**A - 7**	*I don't think this should be a separate form (category). This should be integrated into Form 1. There is so much overlap that it seems very awkward to maintain Form 2 as a separate category.	<We did not get to this section during the workshop>
				Acreage, number, type and location of various important sub-habitats in freshwater & riparian wetlands -- detailed vegetation mapping	**A - 6 M - 1**	*Needs to be determined which are the important subhabitats that this would refer to. *Mapping the details of soils and geomorphology are prerequisites to vegetation mapping. *This could be extensive and expensive. Possibly could be done by local efforts with good training.	
				linear extent of river and stream channel or floodplain with continuous habitat at least ??? m wide.	**A - 5 M - 2**	*It depends on the habitat that is being evaluated what the minimum strip width would be. *This is likely to be arbitrary and reach-specific. *Rather than a set number, perhaps a ratio of corridor width to channel width could be used.	
				Number, **area, depth,** and location of vernal pools	**A - 5 M - 1**	*OK. Make the vernal pool one similar to next element. *Number, location, and management status of the VARIOUS TYPES of vernal pools. *Need a minimum size detailed here. With the interaction of ESA, this could prove problematic without safe harbor of some sort for ocally owned public and private lands.	
2.2	STATE: Patch size frequency	What is the distribution in patch sizes?		Number, area, width, area/perimeter ratio of freshwater marsh and riparian patches (1)	**A - 7**	*Relative degree of isolation may be much more important than empirical size. An isolated acre on the Sacramento River may have less value than a contiguous acre along a reach of a small tributary.	
2.3	STATE/PRESSURE: Habitat gain & loss due to natural processes	<See Review Form 1>		Location & distribution of changes in extent of habitat due to hydrologic, geomorphic, and energetics processes	**A - 4 M - 2 E - 1**	*Seems like this should be consolidated with one or all of the previous to determine causes for change in size or extent . *Need to monitor changes in waterways/wetlands due to excessive siltation caused by infestation of nonnative plants. *This is too vague and should be eliminated *This could turn out to be rather crude. Deciding whether change is owing to "natural" causes in California can only be done in very macro cases.	

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The patch/local site level monitoring was not considered relevant for this section.

			Patch / Local Site	Regional level			
No.	State, Pressure or Action Attribute	Rationale	Monitoring Element	Monitoring Element	Evaluation	Pre- and Post- Workshop Comments	Comments during workshop
2.4	PRESSURE: Habitat loss due to land conversion	How much freshwater marsh and riparian habitat was converted to other land uses since baseline? Where is it located?		Location and acreage of freshwater marsh, woody riparian, seasonal wetlands, perennial grassland, and natural upland areas converted to other land uses since baseline.	A - 4 M - 3	*Also vernal pools and continuous habitats *Important to record what that land conversion is (row crop, orchard, vineyard, pasture, etc.) since this dictates restoration strategies *This should also state "habitat gains and losses." There are increasing numbers of land conversions from ag/urban to "natural" habitats.	
				linear extent of river and stream channel or floodplain with continuous habitat lost due to conversion to other land uses or disconnection from the floodplain	A - 5 M - 2	*when evaluating this loss on a floodplain, it is areal extent, rather than linear extent, which is important.	
		How much freshwater marsh and riparian habitat has been lost due to CALFED actions?		Extent & location of freshwater marsh or riparian habitat lost due to CALFED actions.	A - 6 M - 1	*Should have one monitoring element to monitor losses or changes in these regardless of who caused them. *Clarify whether this is just direct CALFED actions, or actions supported by CALFED as well.	
NEW (2.4)	PRESSURE: NEW	How much seasonal wetland, vernal pool, and grassland habitat has been lost due to CALFED actions?		Extent & location of wetland, vernal pool, and grassland habitat lost due to CALFED actions.	NEW (2.4)		
2.5	PRESSURE: Potential habitat loss due to land conversion	Where and how much freshwater and riparian acreage is at-risk of being converted to other land uses?		Location & acreage of areas of freshwater marsh and riparian areas at risk of being converted to other land uses	A - 6 M - 1	*This parameter will involve a large degree of conjecture, and could be used in ways never intended when the data hits the streets.	
				Location & acreage of habitats adjacent to freshwater & riparian habitats at risk of being converted to other land uses & projected type of new land use.	A - 6		
				Location, distance to, and extent of urbanization near freshwater marsh and riparian wetlands	A - 5 M - 1	*Seems to fit into the "at risk" monitoring elements above.	

Table FR2. Summary of Comments -- Freshwater & Riparian Wetland Habitat Extent & Connectivity

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The patch/local site level monitoring was not considered relevant for this section.

			Patch / Local Site	Regional level			
No.	State, Pressure or Action Attribute	Rationale	Monitoring Element	Monitoring Element	Evaluation	Pre- and Post- Workshop Comments	Comments during workshop
2.5 Cont.				Land use adjacent to freshwater marsh and riparian wetlands	A - 4 M - 1	*Seems to fit into the "at risk" monitoring elements above.	
				Acreage and location of freshwater marsh, riparian habitats, seasonal wetlands, perennial grassland and upland habitat types in public ownership	A - 5 M - 1	*Need to add vernal pools to be consistant with previous monitoring elements.	
2.6	ACTION: Freshwater marsh and riparian acreage restored	ERPP: Protecting, enhancing and restoring freshwater marsh, seasonal wetlands, vernal pools, riparian habitat, perennial grassland habitat ERPP: location of setback levees to expand potential floodplain ERPP: restoration of seasonal wetlands ERPP: reconnect channel with portion of floodplain by purchase of flood easements or floodplain land from willing sellers ERPP: Designating and acquiring "stream erosion zones" to reduce the use/need of bank riprap and allow greater natural recolonization ERPP: restoration of flood refuge habitat along levees and adjacent lands		Extent, location, restoration status of restoration projects in floodplains: freshwater marsh, seasonal wetlands and riparian habitat	A - 5 M - 1	*Need to more precisely define "restoration status" *This section should also include estimates of watershed improvements owing to land use decisions and other management tools that go beyond projects.	
				Extent, location, & restoration status of set-back levees to restore floodplains	A - 5 M - 1	*Need to more precisely define "restoration status"	
				Protection status of vernal pool habitat	A -6		
				Extent, location, & restoration status of CALFED mitigation projects in freshwater marsh, seasonal wetlands, riparian habitat and vernal pools.	A - 5 M - 1	*Need to more precisely define "restoration status"	

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The patch/local site level monitoring was not considered relevant for this section.

			Patch / Local Site	Regional level			
No.	State, Pressure or Action Attribute	Rationale	Monitoring Element	Monitoring Element	Evaluation	Pre- and Post- Workshop Comments	Comments during workshop
CONNECTIVITY AMONG FRESHWATER & RIPARIAN WETLAND PATCHES (ERP Strategic Objectives 4.2, 4.3, 4.4)							
2.8	STATE: Connectivity between patches & groups of patches	To what degree are freshwater marsh and riparian areas spatially connected relative to isolation of species or populations?		Spatial distribution of patches of freshwater marsh, riparian, and seasonal wetlands	A - 5 M - 1	*Needs to include an estimate of gradient values (both in space and time) between habitat types (such as hydrophillic to xeric)	<We did not get to this section during the workshop>
				Habitat pattern indices (patch contagion & interspersion, patch cohesion, inter-patch distance, distribution, etc.)	A - 5		
				linear extent of river and stream channel or floodplain with continuous habitat at least ??? m wide.	A - 4 M - 1	*Same comment as above. *when evaluating this loss on a floodplain, it is areal extent, rather than linear extent, which is important.	
				acreage and linear extent of contiguous habitat	A - 5		
				dispersal success rate for some indicator species?	A - 3 E - 1	*How would this be a monitoring element? Not sure about this one	
2.9	PRESSURE: Barriers to species movement	Barriers block movement between patches for species		Location of barriers to species movement (roads, levees, urban areas, etc)	A - 5 M - 1 E - 1	*This is important, but not sure about monitoring it separately. *This will be very species specific. Are we considering all, or just the MSCS?	
2.10	PRESSURE: Land conversion	Land conversion due to urbanization, changes in agriculture or other land use changes can decrease connectivity between patches		Changes in land use over time	A - 6		
2.11	PRESSURE: Potential land conversion	CALFED must be aware of future land conversion problems in order to determine what areas need to be protected		Maps showing potential or anticipated land use conversion including areas of urbanization near freshwater marshes and riparian areas, seasonal wetlands, vernal pools, and upland areas	A - 6 E - 1	*Seems like this was already covered in previous element. (2.4) *These maps will undoubtedly result in considerable "distraction" from the less judgemental parameters. This should be done by others, if it is necessary to do at all.	

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The patch/local site level monitoring was not considered relevant for this section.

			Patch / Local Site	Regional level			
No.	State, Pressure or Action Attribute	Rationale	Monitoring Element	Monitoring Element	Evaluation	Pre- and Post- Workshop Comments	Comments during workshop
2.12	ACTION: Freshwater and Riparian wetlands restored	ERPP: Protecting, enhancing and restoring freshwater marsh, seasonal wetlands, vernal pools, riparian habitat, perennial grassland habitat ERPP: location of setback levees to expand potential floodplain ERPP: restoration of seasonal wetlands ERPP: reconnect channel with portion of floodplain by purchase of flood easements or floodplain land from willing sellers ERPP: Designating and acquiring "stream erosion zones" to reduce the use/need of bank riprap and allow greater natural recolonization ERPP: restoration of flood refuge habitat along levees and adjacent lands		Extent, location, restoration status of restoration projects in freshwater marsh, seasonal wetlands, vernal pools, riparian habitat, perennial grasslands	A - 5 M - 1	*Can 2.12 be combined with 2.6 since the rational is is the same? *define status	
				Extent, location, and status of new levee maintenance efforts that expand potential floodplain or restore flood refuge habitat along levees and adjacent lands	A - 5 M - 1		
				Extent, location, and restoration status of projects to reconnect channel with portion of floodplain by purchase of flood easements or floodplain land from willing sellers	A - 5 M - 1	*Combine with other monitoring elements.	

Table FR3. Summary of Comments -- Freshwater & Riparian Wetland Habitat Quality in Support of Biodiversity, including MSCS Species

This table summarizes the Freshwater and Riparian Wetlands workshop comments (9/7/2000)in the same format that participants conducted the review. See figure 2 for description of table.

			Patch / Local Site level		Regional level			
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Evaluation**	**Monitoring Element**	**Evaluation**	**Pre- and Post- Workshop Comments**	**Comments during workshop**
GENERAL COMMENTS								
* Fauna section: Need to monitor occurrence of all nonnatives (which may negatively impact native species in various ways). * I suggest that more emphasis should be placed on fire effects and fire recovery from (xx acres) minimum fires sizes and types. More knowledge is needed about the effects of fire temperature on the recovery potential of burned lands.								
VEGETATION COMMUNITY STRUCTURE (ERP Strategic Objectives 1.3, 4.2, 5.5, 5.7, 6.1, 6.3)								
3.1	STATE: Mosaic of vegetation communities	What are the extent and location of the various vegetation communities? Mapping of vegetation is critical to assessing status and trends in vegetation, habitat for species, and the effects of hydrologic & geomorphic processes on habitat. Patch topography, patch age, and previous land use history are important covariates for assessing current vegetation communities and the succession directions they will likely proceed upon.	*detailed vegetation mapping*	**A - 7**	*detailed vegetation mapping*	**A - 6** **E - 1**	*Not sure that detailed mapping is needed regionally *detailed mapping of geomorphology and soils at both the regional and patch level is necessary to develop maps of past and potential terrestrial vegetation.	3.1 and 3.2 should be combined The issues need to be better designed before one can get to the resolution issues. Habitat definitions are pretty well defined at the regional level, i.e. NDDB. However at the local/patch level these haven't been worked out. The specific scales used depend on the issues involved, i.e. mapping species-specific habitat. A conceptual model is needed.
			spatial distribution of sub-habitat types/vegetation communities	**A -7**	spatial distribution of sub-habitat types/vegetation communities	**A - 6** **E - 1**	*Not sure that this is needed either on a regional scale.	
			topography	**A - 5** **E - 1**	regional topography	**A - 5** **E - 1**	*Why would you need to monitor topography? Not clear of reasoning here. *Unclear what would be evaluated	
			age/maturity of patch	**A - 5** **E - 1**	ages of patches of freshwater & riparian wetlands and/or time since restoration efforts	**A - 5** **E - 1**	*Noth sure how this can be done or if it is relevant considering the high degree of succession in natural riparian communities	

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			Patch / Local Site level		Regional level			
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Evaluation**	**Monitoring Element**	**Evaluation**	**Pre- and Post- Workshop Comments**	**Comments during workshop**
3.1 Cont.			patch site history relative to anthropogenic disturbance	**A - 7**			*Shouldn't there be a regional analysis comparing patch distribution to anthropogenic effects?	There is currently a detailed vegetation map of Suisun Marsh. If you don't do detailed mapping you will miss a lot, especially at the site level. There is a statewide vegetation mapping initiative with a fine to coarse scale mapping system in place, although the details aren't worked out. In the Bay-Delta region, the patch size is often small and fine-scale mapping is needed. The question was raised about whether the "R" and "r" species drive the dialogue? Its hard to evaluate the needs without the context of the species involved. CALFED needs to be clearer about what it is trying to restore and what the riparian sub-habitats are and what the species requirements are. Process will have to be both bottom up (species-habitat needs) and top down (combine across needs). Mapping/monitoring techniques should also be standardized and scaleable. The monitoring and mapping techniques needs
3.2	STATE: Vegetation community structure and composition	What are the status and trends in vegetation community structure and composition? What are the status & trends in relative abundance of non-indigenous plant species?	vegetation community structure & composition - tree species diameter at breast height, tree density, size class distribution, tree mortality, canopy height, shrub and vine species and basal area, percent herbaceous cover (3, 21)	**A - 7**	vegetation community structure & composition (3)	**A - 4** **M - 1**	*It seems to me that monitoring of the plant community would entail inclusion of most if not all of the factors listed below (diversity, richness, etc.) *What details of regional vegetation are proposed? *add pecent cover of all strata and dominant plant species *Tracking non-native species needs to have bounds. Do we include annual rye grass, for example?	Add "Species composition - % cover by species" Prioritization needs to occur within each attribute as well as across attributes. (i.e. in 3.2 tree mortality is not as important as % cover by species) It may be better to work at the finer resolution scales first and then move to the regional level. Its always easier to scale up. If you start at the regional level you may wish for more detail at the end.
			species diversity (19)	**A - 6** **M - 1**				
			species richness (19)	**A - 6** **M - 1**				
			key indicator species distribution and	**A - 6** **M - 1**				
			MSCS plant species distribution & abundance	**A - 5** **M - 2**			*Low sample size	

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			Patch / Local Site level		Regional level			
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Evaluation**	**Monitoring Element**	**Evaluation**	**Pre- and Post- Workshop Comments**	**Comments during workshop**
3.2 Cont.			relative abundance **and distribution** of non-indigenous plant species (19)	**A - 4 M - 2**	relative abundance **and distribution** of non-indigenous plant species across sites	**A - 5 M - 1**	*percent cover ?	
			reporting of unidentified plants	**A - 4 M - 1 E - 1**			*Redundant with above?	
			presence/absence of key non-indigenous plant species	**A - 6 M - 1**	distribution & size of patch of key non-indigenous plant species (water hyacinth, egeria, etc.)	**A - 7**		
			percent cover (14)	**A - 6 M - 1**	percent cover (14)	**A - 6 M - 1**		
			canopy gap fraction (14)	**A - 6 M - 1**	distribution of canopy gaps (14)	**A - 6 M - 1**	*See above *Can include with vegetation community structure and composition.	
3.3	STATE: Geomorphic/plant establishment dynamics	What is the establishment rate and type of seedlings in new sediment deposits? The cumulative effects of sediment type, flow, floodplain inundation depth, duration, and timing, and groundwater levels all affect the new plant seedlings being established. Altered flows and hydrographs may favor establishment of non-indigenous plants over native plants.	plant seedling establishment rate and species in new sediment deposits	**A - 6**	sub-habitat acreage changed based on channel migration (1)	**A - 6**		
3.4	STATE: Plant-succession dynamics	Is natural plant succession **occurring** in such a way that a full range of riparian and freshwater marsh plant community types and ages will be present in the future? Different animal species are dependent on different riparian and freshwater marsh plant community types, some of which require decades to mature. The future mosaic of plant communities must be considered as well as the present.	successional direction	**A - 5 E - 1**	sub-habitat acreage change based on vegetation succession (1)	**A - 5 M - 1**	*I think that vegetational change should be monitored, but each cause of change could be monitored simultaneously, rather than separately. Notes on cause of change (succession, fire, etc.) should be made. * Should get reference sites that are in good quality "natural" settings and monitor serial changes, but remember that there a big range that is probably acceptable. Need low intensity photography and monitoring of transects or herbs in selected areas. Succession is strongly affected by invasive exotics.	

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			Patch / Local Site level		Regional level			
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Evaluation**	**Monitoring Element**	**Evaluation**	**Pre- and Post- Workshop Comments**	**Comments during workshop**
3.5	STATE: Inundation duration, frequency, and season suitable for each habitat type	Inundation duration, frequency, and timing are important covariates in determining vegetation community composition and structure	Acreages of floodplain inundation duration, frequency, and seasonality of woody riparian, freshwater marsh, seasonal wetlands, and associated upland habitats based on synthesis from detailed topography (both channel and floodplain) (1, 11))	**A -7**	Acreages of floodplain inundation duration, frequency, and seasonality of woody riparian, freshwater marsh, seasonal wetlands, and associated upland habitats based on synthesis from detailed topography (both channel and floodplain) (1, 11))	**A - 7 M-1**	*These are all important variables, but I continue to find the high degree of overlap between forms and components to be awkward. * Could be general based on relative wide tolerances of component species. This could be gotten from satellite imaging periodically. Develop a base map and overlay- imaging from inundation periods	
			stream hydrology (various return-period flows and seasonal hydrographs from the historical record, and available hydrologic-hydraulic relationships (1)	**A - 5 E - 1**	stream hydrology (various return-period flows and seasonal hydrographs from the historical record, and available hydrologic-hydraulic relationships (1)	**A - 5 E - 1**	*Weren't these covered by form No. 1? * increase water monitoring	
3.6	STATE: Soil type suitable for each habitat type	Soil type is an important covariate in determining vegetation communities structure and composition	Soil type and texture	**A - 4 M - 1 E - 1**	Acreage of soil type, based on soil texture, as derived from Quaternary geology map units for riverwash, woody riparian, freshwater marsh, and associated uplands (1)	**A - 5 E - 1**	*A baseline of these data would be good, but I don't think that one needs to monitor soil type over time. *This should task should be included in 3.1 as part of the vegetation mapping effort. Need to add soil profile to patch level monitoring. * Need digital soil suveys. Need the data for vernal pools and marsh types more than riparian	
3.7	STATE: Sediment quality	Wetland sediment quality is an important covariate for vegetation establishment	channel riverwash substrate particle size and distribution	**A - 5 E - 1**			* ??? Silt vs. gravel pretty minor influence for riparian, vernal pools and marshes	
3.8	STATE: Groundwater depth suitable for each habitat type	What is the groundwater depth relative to the habitat type? Groundwater depth and variability is an important determining factor in vegetation communities structure and composition in a given patch.	depth to groundwater table (11)	**A - 5 E - 1**	acreages based on elevation difference between ground surface and average low-flow water surface in areas of woody riparian, freshwater marsh, and associated upland areas (1)	**A - 4 M - 1 E - 1**	*Already measured in previous section, but not sure this is something that needs to be monitored. It should be investigated before revegetation occurs, but not sure monitoring is needed. *Understand that the distribution of terrestrial vegetation is influenced in part by soils and geomorphology. *Do we need to include soil transmissivity rates here, or in "soils" above? * Important for semi-riparian types	
			soil moisture levels laterally from banks (11)	**A - 4 E - 2**			*See above *This is so seasonal that I am not sure if it	

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			Patch / Local Site level		Regional level			
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Evaluation**	**Monitoring Element**	**Evaluation**	**Pre- and Post- Workshop Comments**	**Comments during workshop**
3.8 Cont.			infiltration rate (11)	**A - 4 E -1**			*See above	
3.9	PRESSURE: Contaminants	Herbicides can effect plant vigor of wetland plants	contaminants - herbicides (9)	**A - 5**			*Evaluate Usage? * EPA and Dept. of Food & Ag have data	
3.10	PRESSURE: local disturbances (non-indigenous plant control efforts, levee maintenance activities, fires)	local disturbances to vegetation are important covariates for vegetation community composition & structure	?				*Monitor plant communities, and the causes for change could then be added as well. *Element could be "Type and extent of disturbance"? * Are they large enough to be mapped?	
3.11	PRESSURE: Non-indigenous plants growth, spread, competition	What are the status and trends in the relative abundance of non-indigenous plants in freshwater marsh and riparian wetlands? What are the status and trends in distribution of key non-indigenous plant species? What new introduced plant species have been observed?	Identify unknown plant species during sampling of vegetative	**A - 5 E -1**	Identify unknown plant species from individual sampling sites	**A - 5 E -1**	*It does not seem that you should be monitoring unknown plant species. *These next four should be integrated * Very important, many can be mapped and monitored via aerial photos.	
					Maintain information clearinghouse to report new plants established in region	**A - 5**	*This does not seem to be monitoring.	
			relative abundance of non-indigenous plants in vegetation sampling	**A - 4 M - 1 E - 2**	relative abundance of non-indigenous plants in within vegetation types, across all vegetation types	**A - 4 M - 1 E - 2**	*Include in vegetation surveys already mentioned. *Eliminate. Redundant *Non-indigenous plants include California native plants. * Track and attack -> need to capture and destroy -> need spot surveys -> also can map at detectable time of year	
			presence/absence of key non-indigenous plant species (water hyacinth, egeria, etc.)	**A - 4 M - 2 E - 1**	distribution & size of patch of key non-indigenous plant species (water hyacinth, egeria, etc.)	**A - 5 M - 1 E - 1**	*Eliminate. Redundant *Distribution and patch size are important at the patch level for management considerations and actions.	
3.12	PRESSURE: land use practices in seasonal wetlands and uplands	Land use practices can strongly affect the vegetation communities that occur, I.e. grazing practices	*type of land use*	**A - 6**	*type of land use*	**A - 6**	*Land use monitoring seems essential. * Can be inventoried by RCD's. Also can be categorized and mapped - both land use and land cover	
3.13	PRESSURE-NATURAL: Climate, floods & droughts	Droughts, and floods affect vegetation. Non-indigenous plant spread can be greatest during periods of drought			Occurrence of droughts, floods	**A - 6 E -1**	*Monitoring selective adverse factors separately seems unproductive. All causes of habitat loss/modification should be evaluated. *Non-indigenous plant invasions can also occur throughout the floodplain as a result of floodwater dispersal.	

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3.14	PRESSURE-REDIRECTED EFFECTS: Water Management	Water transfers and water conservation measures may result in changes in water supply in some areas and reductions in seeps around levees and canals (9)	<local effects of water supply changes?>	**A - 5 E -1**	changes in extent and distribution of vegetation across landscape	**A - 5 E -1**	*This should already be covered.	
					local reductions in seeps and ponds due to water conservation measures	**A - 4 M - 1 E -1**	*This should already be covered. *Can reduce seeps and alkali meadows due to declines in the water-table regardless if for conservation or exploitation. {Add element to patch level too.}	
3.15	ACTION: Develop and implement alternative land use practices	ERPP: Develop and implement alternative land use practices that will protect grasslands containing vernal pools and wet meadows and allow existing, **compatible** land uses, such as grazing to continue ERPP: Develop and implement alternative land management practices on public lands to improve seasonal wetland habitat quality or promote habitat recovery, and provide incentives to private landowners to implement desirable land use practices ERPP: Establish additional incentive programs to encourage landowners to establish and maintain seasonal wetlands (7)			Extent, location and status of implementation of alternative land use practices	**A - 7**	* what other land uses than grazing? What land management practices - Water recharge? Multiple use like Yolo WLA?	
3.16	ACTION: modify vegetation management practices along levees	ERPP: designing and acquiring 'stream erosion zones" to reduce the use of bank riprap and allow greater natural recolonization ERPP: design biotechnical slope protection measures that allow riparian vegetation to be established within levees ERPP: identify levee-confined channels and banks where routine vegetation removal by local reclamation districts can be safely discontinued (7)			Increase in riparian vegetation cover in areas where vegetation management practices along levees have been modified.	**A - 6**	*VARIETY, extent, location and status… * need to work it out with adjacent landowners	

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3.17	ACTION: Control efforts for non-indigenous plants	ERPP: weed control programs to suppress expansion of tamarisk, giant reed, locust, and other invasive non-native plants degrading habitat quality and native flora (7)			Number, location and effectiveness of control efforts	**A - 6** **M - 1**	*Not sure how to quantify this, but that would be under the "how" umbrella. *Also need to document the type of control used. (Herbicide, biological, physical, etc.)	
3.18	ACTION: Reduce contaminant loading	ERPP: Reduce the amount of contaminants flowing into the Bay-Delta (7)			Location, status, & effectiveness of efforts to reduce contaminant loading	**A - 6** **M - 1**	*How does this fit under Vegetation Community Structure?	
FAUNA (ERP Strategic Objectives 1.3, 3.3, 4.2, 4.3, 4.4,4.5, 5.6, 5.7, 6.1)								
3.19	STATE: Mammals	What are the status and trends of MSCS mammals in freshwater & riparian wetlands? CALFED does not have specific objectives for monitoring mammal communities other than MSCS species.	MSCS species indices of abundance **and distribution** or presence/absence	**A - 5** **M - 2**	MSCS species indices of abundance **and distribution** or presence/absence	**A - 5** **M - 2**	*Should do indices of abundance vs. presence/absence if we are monitoring. *Likely need life history and population dynamics data to recover species. *EXPENSIVE, SPECIALIZED AND LOW SAMPLE SIZE, RECOMMEND DOCUMNETED PR/AB ONLY * Mammals it needs to be broken out like all of the other species; small mammal, bats, medium mammals, and large mammals or something similar so that all mammal species are covered. While some aspects of this might be very expensive, it still needs to be done. I think it is very important because we need to understand all of the ecological processes that go on, including the status and trends of all of the fauna. This same thing would apply to all of the restoration areas or action areas.	Presence/absence is only useful as a first screen when determining if a species has expanded its range into a new area. Relative abundance should be used once the species is known to be present. Don't disregard the "negative" data, i.e. where no presence was detected. California Partners in Flight have targets for what is a healthy population size and therefore must trace relative abundance. Some monitoring for MSCS species may also be useful for tracking communities as well. It depends on the survey methods used, i.e. surveys for red-legged frogs may catch other frog species in that particular wetland. This data should be kept and used. More than just the MSCS species should be targeted for mammals. We don't want to only design for the MSCS species. Different types of fauna can inform about different pressures in the environment. Mammals are very sensitive to fragmentation, birds are sensitive to patch health. Small mammals are sensitive to the quality of edge habitat. Mammals are important prey species. Coyotes can be important predators.
3.20	STATE: Native anurans (frogs & toads)	What are the status and trends of MSCS native anurans in freshwater & riparian wetlands?	MSCS species indices of abundance **and distribution** or presence/absence	**A - 4** **M - 2**	MSCS species indices of abundance **and distribution** or presence/absence	**A - 4** **M - 2**	*Should do indices of abundance vs. presence/absence if we are monitoring. *Likely need life history and population dynamics data to recover species.	
			presence/absence of deformities	**A - 5** **M - 1**	presence/absence of deformities	**A - 5** **M - 1**	*Need to look at percentage of each species and types of "deformities." This should not be relegated strictly to amphibians, because other species also have been known to exhibit deformities, many related to environmental contamination. *NOT SURE IF USEFUL	

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3.20 Cont.			Presence/abundance of non-indigenous frogs such as bullfrog	**A - 6 M - 1**	Presence/abundance of non-indigenous frogs such as bullfrog	**A - 6 M - 1**	*Need to not only determine presence/absence, but , if monitoring, also what stages present, are they breeding, what are their numbers, are they excluding native amphibians?	
3.21	STATE: Reptiles	What are the status and trends of MSCS reptiles in freshwater & riparian wetlands? CALFED does not have specific objectives for monitoring reptile communities other than MSCS species.	MSCS species indices of abundance **and distribution** or presence/absence	**A - 4 M - 2**	MSCS species indices of abundance **and distribution** or presence/absence	**A - 4 M - 2**	*Need indices of abundance vs. presence/absence. *Likely need life history and population dynamics data to recover species. *PROBABLY PRESENCE ONLY	
3.22	STATE: Waterfowl	What are the status and trends in waterfowl communities in freshwater & riparian wetlands? The status of waterfowl directly relates to a CALFED objective.	Species richness	**A -7**			*No regional analysis? *Add species diversity.	CPIF uses a lot of extensive reference sites (where abundance point counts are conducted) and fewer intensive reference sites (where more detailed monitoring such as reproductive success occurs). This allow assessing status and trends while still gathering some information to explain the causes of the trends. More community monitoring should be added. Monitoring should be related back to the bigger problems in the area. If we don't understand the details of how all the taxa relate together, then its hard to interpret biodiversity and why it is changing.
			Key indicator species indices of abundance or presence/absence	**A - 6 M - 1**	Winter Waterfowl abundances for key species	**A - 6**	*WINTER ONLY	
			sensitive species indices of abundance or presence/absence	**A - 6**	sensitive species indices of abundance or presence/absence	**A - 5 M - 1**	*Probably not a good idea to use presence/absence as an indicator *ARE THERE ANY?	
					Extent & distribution of habitats preferred by	**A - 7**		
					disease outbreaks in	**A - 7**		
					Harvest reports by	**A - 7**		
3.23	STATE: Wading birds	What are the status and trends in wading bird communities in freshwater & riparian wetlands? This question relates to a CALFED objective.	Species diversity, richness, evenness;	**A - 5 E - 1**	Number, location and size of nesting colonies	**A - 7**	*Not sure what diversity, richness, and evenness mean on a patch level for these taxa. Why not include reproductive success?	
			Key indicator species indices of abundance or presence/absence	**A - 6 M - 1**			*An index would be so much better; I would not use presence/absence	
			sensitive species indices of abundance or presence/absence	**A - 6 M - 1**			*An index would be so much better; I would not use presence/absence	

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3.24	STATE: Shorebirds, e.g., long-billed curlews	What are the status and trends in shore bird communities in freshwater & riparian wetlands? This question directly relates to a CALFED objective.	?				*Why not use the same monitoring elements on the patch level as wading birds? Why not include the brackish areas for these species, salt ponds, etc.? *Surveys *Why don't monitor as for wading birds? *Elements should be monitored at the Patch level (e.g, implementation of a restoration project) and the Regional or landscape level since the attribute is cosists of migratory birds. Monitoring elements should be similar to those for waterfowl and wading birds (i.e., spp. richness/diversity, indicator & sensitive spp., habitat distribution /hab types)?	
3.25	STATE: Other birds (neotropical migratory, raptors, etc)	What are the status and trends in other bird communities in freshwater & riparian wetlands?	Species diversity, richness, evenness;	**A - 6**			*Need to add life history and population dynamic data and nesting and migration habitat assessment to patch level. Follow Parther in Flight landbird monitoring menthods. This monitoring can be applied to REGIONAL LEVEL for landscape level analysis (e.g., identification of source-sink breeding populations, ID key sites for restoration). *SELECTED DIVERSITY AND SPECIES RICHNESS OF CALPIF 14 SPECIES	For most of the species listed, reproductive success has been measured since 1993 at a limited number of reference sites by PRBO. There is a new class of models using vegetation as a surrogate for species of abundance, i.e. Habitat Suitability Index (HSI) spatial models (see also California Wildlife Relationship System). Its been found that not only is the extent of vegetation important, but also the juxtaposition of certain habitats. Currently there are only about 40 models. CALFED could consider investing in more research for vegetation-abundance models for MSCS species. PRBO has a lot of data that could be used. For passerines we need to identify sink and source habitats and identify where problems are occurring. This may require monitoring adult and juvenile survivorship of selected species. The plan needs to at a step above the MSCS species and look for surrogates to monitor that provide better indicators of how a patch is doing.
			Key indicator species indices of abundance or presence/absence (possibly Song sparrow, Yellow warbler, Yellow-breasted chat, Common yellowthroat, Wilson's warbler, Warbling vireo, Swainson's thrush, Black-headed grosbeak, Bank swallow, Swainson's hawk, Yellow-billed cuckoo, American dipper	**A - 7**	abundance and distribution of key indicator species	**A - 7**	*Use as key species, those identified in the California Partners in Flight Bird Conservation Plans (e.g., Riparian Bird Plan, Grassland Bird Plan). * about half are being assessed - mist netting for breeding birds in Clear Creek, Sacramento River	

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			Reproductive success of selected key indicator species (possibly nesting successes, clutch size, nesting attempts per female)	**A - 6 E - 1**			*Why only include here and not for the wading birds? *This seems a little too refined. Can't we just focus on the other variables in 3.25? *Productivity and predation are key factors to avian health. Follow Partners in Flight landbird monitoring methods as practiced by Point Reyes Bird Observatory. Also apply this monitoring to the REGIONAL SCALE for landscape level monitoring. *MEASURE ASSOCIATED NEST VEGETATION AND SUBSTRATE * Yes	
			MSCS species indices of abundance **and distribution** or presence/absence	**A - 4 M - 3**	MSCS species indices of abundance **and distribution** or presence/absence	**A - 4 M - 3**	*Prefer not to use presence/absence *LOW SAMPLE SIZE.RESTRICT TO A FEW KEY SPECIES	
			Previously unreported species observed in area	**A - 5 M - 1 E - 1**			*This would be included in monitoring efforts for other birds; do not do this exclusively.	
			Extent of vegetation communities/habitats	**A - 6 M - 1**	Extent of vegetation communities / habitats	**A - 6 M - 1**	*How does this fit into a monitoring program? Species-specific habitat?	
			*abundance of brown - headed **cow** bird and/or rate of nest parasitism*	**A - 5 M - 1**	*location of areas where brown-headed cowbird parasitism has reached levels to create a problem for local songbirds*	**A - 6 M - 1**	*Although this is an issue of importance for certain species, how is this related to goals of Cal Fed Program? *ASSOCIATED VEGETATION	
NEW (3.25)	STATE: OTHER BIRDS	INDENTIFY SINK/SOURCES	ADULT(AND JUVENILE) SURVIORSHIP OF PASSERINES	**NEW (3.25)**	SAME	**NEW (3.25)**	Combined with repro success gives population modeling capabilities and identifies where population are limited. and identifies * Need to model survivorship here versus the wintering range for birds to determine where is the problem	
NEW (3.25)	STATE: CONNECTIVITY (AND OTHER BIRDS)	JUVENILES FACULTATIVE MIGRATE. USE IN NON BREEDING SEASON (STOPOVER SITES OF MSCS BIRDS)	USE OF CORRIDORS BY MIGRATORY BIRDS	**NEW (3.25)**	SAME	**NEW (3.25)**		

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3.26	STATE: Terrestrial invertebrates	What are the status and trends in insect functional groups? What are the status and trends in MSCS species?	terrestrial insect assemblages abundance and diversity -- pollinators, herbivores, predators, parasites, detritivores, specific prey for endangered bird species.	**A - 5** **M - 2**			*The monitoring of terrestrial insect assemblages abundance and diversity seems beyond the scope of Cal Fed. Is it? *No regional analysis? *DIFFICULT	Comments were mixed about the necessity of this monitoring element. It was pointed out that aquatic invertebrate monitoring is taken for granted. However, this is a lot of work and requires specialist knowledge and is very site specific. It is conducted in the Consumnes monitoring at their intensive monitoring sites because it was felt it would be difficult otherwise to interpret trends. TAMP should consider using surrogates at higher trophic levels plus more comprehensive monitoring at some select reference sites.
			MSCS species indices of abundance or presence/absence (Valley Elderberry longhorn beetle, Delta green ground beetle)	**A - 5** **E - 1**			*TOO VARIABLE	
3.27	STATE: Mosaic of sub-habitats	what are the status and trends in the extent and location of sub-habitats in freshwater & riparian wetlands? Measuring changes in the extent of habitats is expected to be easier to measure and show less variability than measures of species communities.	*Detailed vegetation mapping*	**?**	*Detailed vegetation mapping*		*Not sure about this whole attribute.	
			spatial distribution of sub-habitat types (open water, riverwash, various riparian plant communities, s	**A - 6**	*spatial distribution of sub-habitat types*	**A - 6**	*These are sub-habitats for what kinds of animals? All or any animals? Sounds like a catchall that would be tough to do.	
			Vegetation Community structure & composition (see above)	**A - 5**			*Isn't much of this already included in the vegetation component?	
			Abundance of debris and detritus in a range of size classes	**A - 5** **M - 1**			*Not sure if detritus should be included here	
			Presence of important structural features (snags, ponds, sand bars, etc)	**A - 5** **E - 1**	number and location of patches with important structural features (Snags, ponds, sand bars, etc.)	**A - 5** **E - 1**	*Couldn't this be integrated with with second element above?	
3.28	STATE: Patch size	How many patches of riparian habitat are large enough to support the MSCS species sensitive to patch size (yellow-billed cuckoo, ???)	*Patch size*	**A - 3**	Patch size distribution	**A - 3**	*Do you want to come up with patch size requirements for ALL the rare and endangered species in the watersheds? This could be pretty daunting a task. Why choose the cuckoo?	
					Number of patches along Sacramento river of riparian habitat at least 200 meters wide and 500 acres in size (9)	**A - 4** **M - 1**	*Do you want to come up with patch size requirements for ALL the rare and endangered species in the watersheds? This could be pretty daunting a task. Why choose the cuckoo? *This seems very specific. Is this the cuckoo requirement?	

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3.29	STATE: Connectivity between patches & groups of patches	What is the status of connectivity among freshwater & riparian wetland habitat patches? "Connectivity" is relative to the dispersal abilities of species. Barriers, distances between patches, availability of dispersal corridors all affect the functional "connectivity" between patches.	distances to nearby similar patches	**A - 5**	Distribution of distances to nearest patch relative to dispersal distances of indicator species	**A - 5**	*This whole patch concept is valid, but monitoring of changes in patches and patch relationships sounds pretty geared to modeling studies. Is this what is wanted and needed? *Much the same as 2.8	
			Location & types of barriers to movement to other patches	**A - 5**	Location & types of barriers to movement between patches	**A - 5**	*Much of this seems to have already been covered in the vegetation part. Can overlap be prevented or the two melded some how?	
			Index of movement capability to other patches (existence of migration corridors, lack of barriers, etc)	**A - 5**	Index of movement capability between patches (existence of migration corridors, lack of barriers, etc)	**A - 5**	*Has this sort of thing been worked out? This seems like a separate major study rather than merely a monitoring element.	
			Movement of indicator species into and out of patch	**A - 5**	<Index of movement among patches by an indicator species>	**A - 5**	*What type of species would be chosen for an indicator?	
					Number and location of functionally isolated patches	**A - 3**	*May be very difficult for many species	
					Location of groups of patches functionally isolated from other groups of patches	**A - 3**	*May be very difficult for many species	
3.30	STATE: Connectivity with upland habitat	Small mammals and reptiles require upland refugia with sufficient cover from predators in order to escape rising floodwaters.	Presence of transition habitat to uplands and upland buffer habitat that would support small mammal populations and provide suitable foraging habitat for raptors and other grassland associated species (9)	**A - 5**	Number, extent, & location of wetland and riparian patches with adequate transition habitat to uplands to support small mammals during flooding.	**A - 5**	*Seem to be too many qualifiers to put into a monitoring element. There would be a wide range of responses to this, and quantification would be very hard. *TRANSITION HABITAT IMPORTANT FOR BREEDING, JUVENILE AND MIGRATING BIRDS	
					Number, extent & location of wetland and riparian habitat patches with no real connectivity with upland habitat rendering it of low quality to much terrestrial fauna.	**A - 5**	*The conclusion that the patch is of low quality seems to be a value judgment that need not be in the monitoring element description.	
			Overwintering refuge areas	**A - 5**			*overwintering for whom? *Could add the number and distribution of refugia areas to Regional level monitoring	

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3.30 cont.			Land use practices in the transition zones (grazing, etc)	**A - 6 M - 1**	Land use practices in the transition zones (grazing, etc)	**A - 6 M - 1**	*We already have land-use being monitored in an earlier element. Do we need it just for fauna? Define transition zones. *VERY IMPORTANT	
			<presence of species that require connectivity with upland habitat>	**A - 5 M - 1**	<number of patches with species present that require connectivity with upland habitat>	**A - 5 M - 1**	*What species, strictly mammals and reptiles?	
3.31	PRESSURE: Some land use practices in managed seasonal wetlands & riparian zones, I.e. farming practices, grazing, etc.	Land use practices can affect the utility of that land as habitat for species. For example grazing can degrade vernal pool habitat unless protected. Grain crops can be managed so that tillage practices leave winter forage available for waterfowl and sandhill cranes.	*type of land use*	**A - 4 M - 1**	*type of land use*	**A - 4 M - 1**	*Done that.	
			utility of land use as habitat for waterfowl, wading birds, neotropical migratory birds, others	**A - 5 M - 1 E - 1**	utility of land use as habitat for waterfowl, wading birds, neotropical migratory birds, others	**A - 5 M - 1 E - 1**	*Do we need to monitor land use for wildlife suitability separately from other land-use monitoring described earlier? Seems that we could take land use data and apply it to suitability for wildlife enhancement. *Redundant with 3.12 *Very poor example for rational because exclusion of grazing is known to degrade vernal pool habitat!	
3.32	PRESSURE: Some adjacent land use practices & buffer zones	Adjacent land use practices can either provide additional habitat for wildlife species or provide additional pressures. Urbanization increases affects due to non-indigenous pets, recreational disturbance etc. Pesticide drift can affect terrestrial invertebrate communities including the "R" species Valley Elderberry Longhorn Beetle. Use of rodenticides can impact non-pest small mammals in neighboring riparian areas.	type of adjacent land use	**A - 5 M - 1**	mapping of adjacent land use to freshwater marsh and riparian wetlands	**A - 5 M - 1**	*Land use already monitored. *Redundant with 3.12	Issue was raised about the lack of refugia from flood waters in the bypasses and what should be the role of refugia in bypasses. Dave Ceppos said he would take the issue to the Yolo Bypass group. However the bypasses are managed first for flood control and secondarily for wildlife.
			utility of adjacent land as habitat for riparian, seasonal wetland, freshwater marsh species	**A - 5 M - 1**	categorize by utility of adjacent land as habitat for riparian, seasonal wetland, and freshwater marsh species	**A - 5 M - 1**	*See above. *Redundant with 3.12	
			crop type in adjacent lands	**A - 5 M - 1**	crop type in adjacent lands	**A - 5 M - 1**	*Crops change seasonally and annually. How would one do this monitoring in the most effective manner?	
			wildlife friendly agricultural practices in adjacent land areas	**A - 5 M - 1**	amount and distribution of land adjacent to riparian areas in wildlife friendly agricultural practices	**A - 5 M - 1**	*This is a subjective element that would be difficult to monitor. Wildlife friendly to one species might not be so for other species. Rice might be great for certain waterfowl, but might not be for others.	
			presence of buffer zones between riparian zones and other land uses of natural habitat or wildlife friendly agricultural habitat	**A - 5 M - 1**	presence of buffer zone of grassland and/or wetland habitat from other land uses	**A - 4 M - 2**	*This is another subjective element that assumes that "buffer zones", which are not defined, are quantifiable for "wildlife friendly" agricultural habitats. *Amount and distribution of buffer zones between habitat and other land uses that are wildlife friendly.	

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3.32 Cont.			Distance from edge and center of patch to land uses that cause habitat quality degradation, I.e. urban areas, agricultural practices that result in pesticide drift or favor brown-headed cowbird, land uses that favor non-indigenous pets, recreational disturbance, roads, etc.	**A - 5 E - 1**			*This seems to be even more subjective and difficult to measure and monitor. Too many types of species, land uses, practices, patch types and locations, etc. to be monitored effectively. *Perhaps add to Regional Level monitoring, distribution of patches with some minimum distance from edge and center of patch to land uses that cause degradation of habitat quality.	
3.33	PRESSURE: Local disturbance (non-indigenous species control, levee maintenance activities, gravel mining, fires)	Local disturbances to fauna are covariates for measures of animal communities	?	**A - 4 M - 2**			*Seems to fit with the previous element. *Redundant with 3.12 *Type and extent of disturbance? *MONITOR ACTIVITIES OF LEVEE DISTRICTS	
3.34	PRESSURE: Predation by non-indigenous animals - foxes, rats, feral cats & dogs	Predation by non-indigenous animals - foxes, rats, feral cats & dogs is an important pressure on the riparian brush rabbit and San Joaquin valley woodrat. (7) Feral cats are the main predator of ground-nesting birds in the Central Valley. (12)	Presence/absence or index of abundance of introduced predators on small mammals in Casswell State Park and other areas where these species are present	**A - 5 M - 1**	?		*Presence/absence will not tell us much about the threat of these predators to small mammals. These predators can also affect nesting, especially ground, or low shrub, nesting birds. Example: foxes caused abandonment of wading bird colony on Bair Island. *A large pressure everywhere (urban, agricultural). Nest success of passerines birds is a good indicator of predation problem. May be mitigated by frequent disturbances.Initate regional control programs and test effect. *Need a Regional Element for this Attribute too. *Add to regional: Distribution and indicies of abundance of introduced predators on small mammals and birds?	This needs to include native predation as well. Scrub jays and raccoons both have a big impact in the Valley. There was some discussion on whether this element should be a monitoring element or if it should be a research item to assess the extent of the problem first. We can't eradicate these non-indigenous species even though we know they are a problem although there may be actions that can reduce their impact on native species. Don't get overly specific about locations, i.e. don't mention just Casswell State Park.

Table FR3. Summary of Comments -- Freshwater & Riparian Wetland Habitat Quality in Support of Biodiversity, including MSCS Species

This table summarizes the Freshwater and Riparian Wetlands workshop comments (9/7/2000)in the same format that participants conducted the review. See figure 2 for description of table.

			Patch / Local Site level		Regional level			
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Evaluation**	**Monitoring Element**	**Evaluation**	**Pre- and Post- Workshop Comments**	**Comments during workshop**
3.35	PRESSURE: Abundance of brown-headed cowbird	Nest parasitization by brown-headed cowbirds is an important stressor for open-cup neotropical migratory songbirds. Parasitism rates are thought to be decreased in large patch size and increased by proximity to land uses that favor cowbirds.	*abundance of brown headed bird and/or rate of nest parasitism*	**A - 4**	*location of areas where brown-headed cowbird parasitism has reached levels to create a problem for local songbirds*	**A - 4** **M - 1**	*It is one thing to census or develop an index of abundance, but to evaluate the impacts on other species may require more than simple monitoring. *Same as 3.25? *VIRTUALLY EVERYWHERE.	
			patch size	**A - 2** **M - 1** **E - 1**	patch sizes of riparian zones across the landscape	**A - 3** **M - 1** **E - 1**	*Monitoring of Patch size by itself seems inappropriate. This seems to be part of a larger land-use monitoring effort in which the area of each use is monitored. Cowbird issues could then be assessed *HABITAT QUALITY MORE IMPORTANT	
			proximity to land uses that favor brown-headed cowbirds	**A - 3** **M - 1**	land use adjacent to riparian zones, particularly land uses that favor cowbirds (feedlots, etc.)	**A - 4** **M - 1**	*It seems to me that cowbird inferences could be made from other data collected without making it a separate monitoring element. *Identify habitat fragmentation characteristics (e.g.,patch size and distribution) from landscape level patch analysis that favor brown-headed cowbirds.	
3.36	PRESSURE: Introduction of red-eared slider (Delta)	Introduction of red-slider turtles may create problems for native turtles in the future. Monitoring the presence and spread seems appropriate	Presence/absence of red-eared slider during reptile sampling	**A - 4** **M - 1** **E - 1**	Location of areas where red/eared slider has been observed	**A - 4** **M - 1** **E - 1**	*I do not discount the potential problem of red-eared sliders in the study area. However, I am not sure why certain specific cases are listed and not others. It seems that the inclusion of turtle identification during the reptile monitoring would be sufficient to document slider, snapping turtle, etc. in the landscape. *Integrate with 3.21	
3.37	PRESSURE: Predation by introduced bullfrogs	Presence of introduced bullfrogs is directly related to the disappearance of native frogs.	presence/absence of bullfrog in ponds & pannes during amphibian sampling	**A - 4** **M - 1**	Location of areas where introduced bullfrog has been observed	**A - 4** **M - 1**	*Again, although the bullfrog problem is one that is of huge importance, I see no reason to monitor them separately from the monitoring shown in 3.20 (Native anurans Monitoring). Bullfrog presence and status (reproducing or not, for example) could be added to that element without downgrading its importance. *Integrate with 3.21 *Bullfrogs may also prey upon endangered, threatened, and rare amphibians and reptiles.	

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No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Evaluation**	**Monitoring Element**	**Evaluation**	**Pre- and Post- Workshop Comments**	**Comments during workshop**
3.38	PRESSURE: Contaminants - Selenium, Mercury, Other	Measuring aquatic toxicity should provide earlier warning and response to changes in contaminant levels than measures in the terrestrial system. We expect that aquatic toxicity measures will be more fully detailed in the aquatic monitoring plan.	Aquatic toxicity measures (fish tissue, benthic invertebrates communities, algal communities)	**A - 4 M - 1 E - 1**	Aquatic toxicity measures (fish tissue, benthic invertebrates communities, algal communities)	**A - 4 M - 1 E - 1**	*I don't understand why for the terrestrial and amphibious monitoring program we are listing aquatics to be evaluated and monitored for these contaminants. I suggest replacing these with terrestrial or amphibious taxa such as birds (eggs or adults of various swallows, wading birds, cormorants, waterfowl, etc.), amphibians (adult or larvae), and mammals (river otters, muskrats, and bats, for example) *Eliminate as this should be in Aquatic plan. *How about the measuring toxicity in amphibian (native frogs) and avian tissue (waterbirds such as coots)?	Current aquatic toxicity monitoring is mainly focused on human health issues. There may be a need to explore some other contaminant issues. i.e. diesel fuel seeping into groundwater, pharmaceuticals, estrogen. These may be targeted research issues for right now. Mercury is a problem and bioaccumlation is affecting some terrestrial species such as birds. Some monitoring is already occurring. Coordinate with EPA, Sacramento River Watershed Program, USGS-WRD
3.39	ACTION: Reduce populations of bullfrogs	ERPP: reduce populations of bullfrogs (7)			Location, status, & effectiveness of control efforts for introduced bullfrogs	**A - 6 M - 1**	*It seems that this might better be done on the patch level since there is no regionwide effort to do this. In addition, this would possibly fit again into the anuran monitoring element. Trends in bullfrogs as well as natives could be tracked and evaluated together.	
3.40	ACTION: Buy-back program for red-sliders	ERPP: implement buy-back program for red-sliders (7)			?		*I would be interested in seeing the details of such a program and how one would monitor its success. *Monitor response - (number of sliders purchased through buy-back)	

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No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Evaluation**	**Monitoring Element**	**Evaluation**	**Pre- and Post- Workshop Comments**	**Comments during workshop**
3.41	ACTION: Develop and implement alternative land use practices	ERPP: Develop and implement alternative land use practices that will protect grasslands containing vernal pools and wet meadows and allow existing, compatible land uses, such as grazing to continue ERPP: Develop and implement alternative land management practices on public lands to improve seasonal wetland habitat quality or promote habitat recovery, and provide incentives to private landowners to implement desirable land use practices ERPP: Establish additional incentive programs to encourage landowners to establish and maintain seasonal wetlands (7)			*Extent, location and status of implementation of alternative land use practices*	**A- 6**	*VARIETY, extent, location and status...	
3.42	ACTION: Improve wildlife friendly agricultural practices in areas near freshwater and riparian wetlands	Improve wildlife friendly agricultural practices in areas near freshwater marsh and riparian wetlands: ERPP: deferring fall tillage until later in year can increase quantity of forage on cornfields for waterfowl and greater sandhill cranes ERPP: shallow flooding of seasonal croplands in fall/winter can greatly increase the availability of forage for wintering waterfowl ERPP: retaining a percentage of the unharvested crop in the agricultural field would enhance the value of flooding (7)			Location, status, & effectiveness of efforts to improve wildlife friendly agricultural practices near freshwater & riparian wetlands	**A - 4** **M - 1**	*It seems that this information will be available by interpreting the results of the land-use monitoring previously described. Perhaps specific monitoring is required to better evaluate the effectiveness of the projects? Evaluation of the effectiveness seems to be a difficult aspect of this element. How is that to be quantified so that it can be compared over time and space?	

Table FR3. Summary of Comments -- Freshwater & Riparian Wetland Habitat Quality in Support of Biodiversity, including MSCS Species

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No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Evaluation**	**Monitoring Element**	**Evaluation**	**Pre- and Post- Workshop Comments**	**Comments during workshop**
3.43	ACTION: Reduce contaminant loading				*Location, status, & effectiveness of efforts to reduce contaminant loading*	**A - 4** **M - 1**	I am concerned that this element, unlike many preceding it, is way too broad in its concept. Individual contaminants are not listed, and effects on fauna and flora are not described. Each contaminant can have such a wide range of effects on each trophic level of the food web, producing a very complex range of impacts. The key here is the "effectiveness" of the efforts to reduce loading. Unfortunately, many contaminants have synergistic effects such that clean up of individual sites or contaminants may not have a measurable effect on the food web. *VARIETY, location, status, & effectiveness of efforts...	

WORKSHOP 3
Ecological processes and biological communities across the CALFED Landscape (Sept. 14, 2000)

WORKSHOP 3 OVERVIEW

Participants agreed that non-indigenous plants, contaminants, water and sediment management, and land use change were the primary landscape-level pressures on the terrestrial and amphibious portion of the environment. Although climate change was considered a critical factor affecting the aquatic environment, participants were not clear what measurable effects there would be on the terrestrial environment within the 30 year CALFED program.

Waterfowl were discussed at some length as a landscape-level biological community that would be affected by CALFED actions. Since CALFED would be reducing habitat in some regions and increasing it in others, monitoring of the effects on waterfowl distribution will be important. Other landscape level biological communities to consider could be native anuran amphibians, reptiles, blue oak woodlands, perennial grasslands and possibly sandhill cranes.

The group concluded with a discussion on what should be the highest priority monitoring issues for inclusion in an implementable TAMP.

WORKSHOP 3 – GENERAL DISCUSSION

1) Some general points
A question was raised – Is CALFED more geared towards projects or towards regional issues?

It's important to create an effective link between science and management
Data collection -> info -> knowledge -> decision making -> action

Can the monitoring information be presented in an adaptive management structure?

2) Some additional possible landscape level species and communities that were not mentioned in the monitoring elements
Blue oak woodlands and perennial grasslands might be good plant communities to assess across the landscape.

Sandhill cranes might also be good landscape species, but they may be too habituated, i.e. don't readily expand into new areas.

3) What should be the highest priorities for CALFED to develop first in a terrestrial and amphibious baseline monitoring program? The group spent about an hour discussing what should be the highest priority issues and developed the following list:

- **Physical Landscape changes**
  Including both general changes and changes attributed to CALFED actions
- **Land use changes**
- **Vegetation cover and type changes**
  Including both general changes and changes attributed to CALFED actions
- **Status of MSCS species ('R' and 'r' first)**
- **Monitor assemblages of species to improve understanding and assessment of habitat values**
- **Ecosystem processes and function**
- **Status and trends of non-indigenous species and contaminants**
- **Status and trends of other pressures**

The group couldn't prioritize further than this without more knowledge about what existing programs are already covering, greater detail in the monitoring elements, and a general idea of what the projected budget would be.

Table L1. Comment Summary - Landscape level processes, habitats, & biological communities (9/14/01)				
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Workshop & Post-Workshop (labeled) Comments**
ECOLOGICAL PROCESSES				
HYDROLOGIC (ERP Strategic Objective 2.1, 2.5, 2.6)				
1.0	STATE: Variable river flows	What Sacramento river, San Joaquin River,and tributaries hydrographs compared with the natural hydrographs? Are large flow events occuring frequently enough to cause large changes in channel migration and the associated diverse array of habitats associated with those changes? Deviations from the natural hydrograph affect vegetation establishment and maintenance and groundwater levels. It is also an important covariate for understanding floodplain inundation and channel migration processes. Large flow events cause major changes in channel migration (bend cut-throughs, oxbow lakes,etc) which are associated with a diverse array of habitats years later.	Magnitude, timing, and variability of flow in rivers at tributary mouths compared with historic natural hydrograph (14, 8, 11, 1)	POST-WORKSHOP COMMENT: maybe this could be modified some what to include tributary flows
			Delta Inflow	
			Outflow through Golden Gate	
			Water year, including drought & wet years	
			Occurrence of extreme flood events, capable of major changes in channel and river course	POST-WORKSHOP COMMENT: I would add an element here to include dendtiric conditions that Dennis mentioned at the meeting. I think a landscape level survey of the feeder creeks and tributaries to identify whether or not they reach the river or if they are truncated and combined could identify potential restoration areas in the various watersheds.
1.1	STATE: Salinity gradient in estuary	What are the status and trends in the salinity gradient in the estuary? Water management has greatly changed the salinity gradient length and variability over the historical record. In addition sea level is rising which will also affect the salinity gradient which in turn affects the composition of vegetation communities throughout the region.	salinity measured along longitudinal axis in estuary - range, variability, seasonality	POST-WORKSHOP COMMENT: This seems more of a regional issue than a landscape issue. I would think most of these elements would be some what of a lower priority on the Lanscape Level. While it will be important over the big picture, it will be mostly relevant to the Bay and Delta.
			Changes in vegetation communities reflecting changes in salinity gradient (I.e. conversion of brackish to saline vegetation communities)	
			<see 1.0: River flows, Delta inflow & outflow (covariates)>	
			<see 1.0: Water year, including drought & wet years (as covariate)>	
			tidal regime (as covariate)	

Table L1. Comment Summary - Landscape level processes, habitats, & biological communities (9/14/01)				
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Workshop & Post-Workshop (labeled) Comments**
1.2	STATE: Groundwater table	What is the groundwater depth relative to the habitat type? Groundwater depth and variability is an important determining factor in vegetation communities structure and composition in a given patch.	depth to groundwater table (11)	
			distribution and extent of floodplain habitats (11)	
1.3	PRESSURE: water management	Water management changes including reservoir releases, water diversions and return flows, water transfers and groundwater pumping affect the amount timing and variability of flows throughout the season from the historical hydrograph. Flows and groundwater pumping can also affect the depth to the groundwater table which in turn affect riparian vegetation.	releases from dams	Water management should be changed to water and sediment management because dams not only influence hydrology but sediment processes as well. A missing attribute might be the cumulative loss/change of dendritic pattern of streams and channels – this affects rivers when added up across the landscape. Runoff management often causes the conversion of several channels into 1 culvert. This is related to urbanization and land use changes. Locally this is a small issue, but it adds up to a big effect across the landscape. Phillip Williams and Associates have mapped and calculated the impact. However, this might fall under a watershed management category. Flood management, watershed activities, and erosion control activities should be included. Rivers could be mapped by level of control, i.e. levees, rip-rap, no-levees, etc. There are many efforts at bank stabilization that do retrofit with vegetation, but the bank/levee is still not allowed to move.
			water diversions on tributaries and in Delta & return flows	
			water transfers	
			<see 1.0: Magnitude, timing, and variability of flow in rivers at tributary mouths compared with historic natural hydrograph (14, 8, 11, 1) (covariate)>	
			<see 1.2: depth to groundwater table (11)>	
			<See 1.0: Delta inflow, Delta outflow (covariates)>	
			<See 1.0: Outflow through Golden Gate (covariate)>	
1.4	PRESSURE-NATURAL: Sea level Rise	Sea level rise is expected to have several effects on the estuary-- * possible changes in the extent of vegetated marsh plain if marsh plain elevation rise cannot keep pace with changes in sea level * possible changes in the salinity gradient in the estuary as sea water encroaches further into the estuary.	Sea level at fixed point in estuary (Golden Gate Bridge ?)	POST-WORKSHOP COMMENT: This seems more of a regional issue than a landscape issue. I would think most of these elements would be some what of a lower priority on the Lanscape Level. While it will be important over the big picture, it will be mostly relevant to the Bay and Delta
			<See 1.1: salinity measured along longitudinal axis in estuary - range, variability, seasonality>	
			<See 1.1: Changes in vegetation communities reflecting changes in salinity gradient (I.e. conversion of brackish to saline vegetation communities)>	
			Extent of vegetated marsh plain	

Table L1. Comment Summary - Landscape level processes, habitats, & biological communities (9/14/01)				
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Workshop & Post-Workshop (labeled) Comments**
1.5	PRESSURE-NATURAL: Temperature, climate, floods & droughts	El nino effects, droughts, and floods all affect wetland sustainability. High flood events move large amounts of sediment through the system. Droughts can allow the spread of non-indigenous plant species.	Occurrence of El nino effects, droughts, floods	Climate change and climate variability are important for interpreting the rest of the monitoring in order to separate out the anthropogenic affects. Shifts in ocean currents and temperature may have strongly affected striped bass. Climate change could affect timing of winter storms, winter temperature, amount and timing of runoff. These in turn could affect how the reservoirs are operated. Which could in turn affect erosion and sedimentation. Increasing CO2 levels could increase some plant species productivity, could increase water demand, change competition dynamics among plants, and even affect groundwater levels. It could cause increased invasion by non-indigenous plant species. Extreme events drive a lot of changes in the terrestrial system, droughts, floods, etc. Are these extreme events becoming more likely? The implications for the terrestrial species over the course of a 30 year program are not clear. Tracking changes may be necessary to interpret other monitoring. But its of low priority otherwise. Try and tie to what other studies and monitoring are already occuring.
			Spring and summer temperatures, snowpack melt, and seasonal runoff amount and timing	
			Long-term trends in seasonal temperature changes in California and relation to snowmelt timing.	
			Yearly precipitation and snowpack status	
			Weather, climate	
1.6	ACTION: Balance seasonal flows from reservoirs for fisheries, water conveyance, flood control, and the needs of other habitats	balance seasonal flows from reservoirs for fisheries, water conveyance, flood control, and the needs of other habitats (9)	*<See 1.0 Delta inflow & outflow>*	
			<See 1.0: Magnitude, timing, and variability of flow in rivers at tributary mouths compared with historic natural hydrograph (14, 8, 11, 1)>	
1.7	ACTION: Establish desirable salinity gradients	establish desirable estuarine salinity gradients by managing water diversions and water releases from upstream reservoirs to control seasonal freshwater inflows to the Delta (7)	*<See 1.1: salinity measured along longitudinal axis in estuary - range, variability, seasonality>*	
			<See 1.1: Changes in vegetation communities reflecting changes in salinity gradient (I.e. conversion of brackish to saline vegetation communities)>	

Table L1. Comment Summary - Landscape level processes, habitats, & biological communities (9/14/01)				
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Workshop & Post-Workshop (labeled) Comments**
GEOMORPHIC - SEDIMENT ACCRETION & EROSION (ERP Strategic Objective 2.3, 2.7)				
1.8	STATE: Horizontal & Vertical Tidal Marsh Erosion & Deposition processes	Is the sediment supply to sufficient to maintain the natural establishment and succession of habitats in tidal wetlands? Is marsh plain elevation being maintained relative to sea level? Maintenance of marsh plain elevation is a combination of sediment accumulation & erosion, biomass accumulation & oxidation, and sea level rise. The extent and location of mudflats reflects the amount of sediment coming into the estuary. Shoreline change shows where marsh is being lost and gained. Concerns have been raised that the sediment supply that helps sustain tidal wetlands will diminish and marsh plain rise will not keep pace with the rise in sea level	Status & trends in extent and location of tidal mud flats Extent of vegetated marsh plain Shoreline change Area of midchannel islands and shoals Tidal inundation status (full, muted, none) (Covariate) *<See 1.4: Sea level at fixed point in estuary (Golden Gate Bridge ?) (Covariate)>*	POST-WORKSHOP COMMENT: This seems more of a regional issue than a landscape issue. I would think most of these elements would be some what of a lower priority on the Lanscape Level. While it will be important over the big picture, it will be mostly relevant to the Bay and Delta.
1.9	STATE: Sediment erosion and deposition in freshwater & riparian habitats	Is the sediment supply to sufficient to maintain the natural establishment and succession of habitats in tidal, freshwater, and riparian wetlands? Sediment supply from upper watersheds has been greatly diminished in many tributaries due to dams and gravel mining. In addition much of the current sediment from gold mining is being gradually washed out of the system.	areas of new sediment deposits and erosion in rivers and tributaries *<See 1.2: distribution and extent of floodplain habitats (11)>*	POST-WORKSHOP COMMENT: Maybe this could include some periodic bathymetirc surveys to monitor the river and tributary channel geography to monitor changes along the bottom rather than wait for point bars to form.
GEOMORPHIC - OTHER? (ERP Strategic Objectives 2.3, 2.6, 2.8)				
	?			

Table L1. Comment Summary - Landscape level processes, habitats, & biological communities (9/14/01)				
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Workshop & Post-Workshop (labeled) Comments**
HABITATS				
HABITAT - EXTENT (ERP Strategic Objectives 4.1, 4.3, 4.4)				
2.1	STATE: Habitat extent & spatial distribution	What are the status & trends in extent and spatial distribution of ERP and NCCP habitats? There are currently two different classification systems in CALFED, both of which currently require monitoring.	Acreage and location of ERP Habitat Types: Tidal Perennial Aquatic Habitat, Nontidal perennial aquatic habitat, Saline emergent wetlands, Fresh emergent wetland, Seasonal wetlands, Riparian and Riverine aquatic habitats, Inland dune scrub habitat, Perennial grassland Acreage and location of MSCS-NCCP habitat types: Tidal Perennial Aquatic, Valley Riverine Aquatic, Montane Riverine Aquatic, Lacustrine, Saline Emergent, Tidal Freshwater Emergent, Non-tidal Freshwater Permanent Emergent, Natural Seasonal Wetland, Managed Seasonal Wetland, Valley/Foothill Riparian, Montane Riparian, Grassland, Inland Dune Scrub, Upland Scrub, Valley/Foothill Woodland and Forest, Montane Woodland and Forest, Upland Cropland, Seasonally Flooded Agricultural Land	POST-WORKSHOP COMMENT: We may want to include HCP's, local watershed programs, and other potential plans that CALFED may be able to compliment or piggy back on. This may be more of a tracking item than a montoring toll but might prove benficial for planning efforts.

Table L1. Comment Summary - Landscape level processes, habitats, & biological communities (9/14/01)				
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Workshop & Post-Workshop (labeled) Comments**
2.2	PRESSURE: Habitat loss of ERP habitat types due to land conversion	How much ERP habitat acreage was converted to other land uses since baseline? Where is it located?	Acreage and location of habitat types converted to other land uses since CALFED baseline year	This pressure should be called "land use change". A change from alfalfa to walnuts can be important. This needs to be worded carefully and a clear rationale included. For example, this information is important for deciding where to put projects. However, monitoring the information and using it to affect decision making are two different tasks, i.e. tracking zoning and affecting zoning are two different things. More detail is needed about the categories of land use, i.e. categories of wetland change, types of urbanization, etc. · The Biodiversity Council has a landuse theme group. We should check their assessment. · CALTRANS has a GIS group · CMCC within California Dept. of Information Technology is looking at monitoring land uses changes (Gary Darling of the Resources Agency is the chair). · CVHJV is debating on whether to include this in their plans/models · HCP's and related programs are already tracking to some extent Not sure if zoning is really important on a landscape level. It is important on a local level. The Water Use Efficiency program may need to gather similar information, so maybe we can coordinate with them.
2.3	ACTION: Acreage res	Where are restoration actions occuring and what are their status	Extent, location, restoration status of restoration projects	
2.4	ACTION: Acreage under protected status	How much acreage has been protected due to CALFED actions?	Acreage of land purchased or otherwise protected through CALFED actions	
			Change in habitat acreage under protection status	
HABITAT - CONNECTIVITY AMONG HABITATS (ERP Strategic Objectives 4.1, 4.3, 4.4)				
2.5	STATE: Connectivity between patches & groups of patches	To what degree are tidal wetlands spatially connected relative to isolation of species or populations?	Spatial distribution of patches	
			Habitat pattern indices (patch contagion & interspersion, patch cohesion, inter-patch distance, distribution, etc.)	
			Location of habitat corridors and acreage of contiguous habitat	

Table L1. Comment Summary - Landscape level processes, habitats, & biological communities (9/14/01)				
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Workshop & Post-Workshop (labeled) Comments**
2.6	PRESSURE: Barriers to species movement	Do landscape barriers only apply to aquatic program or are there relevant terrestrial species?	?	POST-WORKSHOP COMMENT: Monitoring element should be "Presence and distribution of roads. " In answer to the question posed in the Rationale "Some species that come to mind are the Salt Marsh harvest mouse and riparian brush rabbit. In the case of the SMHM, bare patches (such as roads) and open water (ditches) of ten feet present a barrier to movement. In the case of the riparian brush rabbit, they tend to stay within the dense canopies of riparian systems."
2.7	*PRESSURE: Land conversion*	Land conversion can decrease connectivity between patches, by reducing vegetation on levees, by changing to less wildlife friendly agricultural practicies, or by urbanization	*<same as 2.2: Habitat pattern indices (patch contagion & interspersion, patch cohesion, inter-patch distance, distribution, etc.) >*	
2.8	*ACTION: Acreage restored*	Where are restoration actions occuring and what are their status	*<Same as 2.3: Extent, location, restoration status of restoration projects>*	
2.9	ACTION: Habitat Corridors restored		Extent, location, and habitat corridors restored	
BIOTA				
BIOTA - NON-INDIGENOUS PLANTS (ERP Strategic Objectives 5.5, 5.7)				
3.1	PRESSURE: New introductions of Non-indigenous plants	What new introduced plant species have been observed in the CALFED solution area?	Identify unknown plant species from individual sampling sites	Yes, non-indigenous species are a landscape issue. However this category should be expanded to include non-indigenous fauna as well as plants. Abundance and distribution of non-indigenous species should be in the monitoring program. However more research about the transport, mobility, and spread of non-indigenous species is needed. Currently this is only being done by the Dept. of Food and Agriculture for a few key agricultural pests. There is a lot of concern that CALFED will increase the abundance and distribution of invasive species across the landscape. It is important to start this part of the monitoring plan soon.
			Maintain information clearinghouse to report new plants established in region	
3.2	PRESSURE: Non-indigenous plants growth, spread, competition	What are the status and trends in the relative abundance of non-indigenous plants in tidal, freshwater, and riparian wetlands? What are the status and trends in distribution of key non-indigenous plant species?	relative abundance of non-indigenous plants within tidal, freshwater, and riparian wetlands	
			distribution & size of patch of key non-indigenous plant species (Arundo, Tamarisk, etc.)	

Table L1. Comment Summary - Landscape level processes, habitats, & biological communities (9/14/01)				
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Workshop & Post-Workshop (labeled) Comments**
3.3	ACTION: Control efforts for non-indigenous plants where non-native plants have degraded habitat quality	Control efforts for non-indigenous plants where non-native plants have degraded habitat quality	Number, areal extent and effectiveness of control efforts for non-indigenous plants due to CALFED actions	There are various different parts of a non-indigenous species control program which should be considered.. · interception – i.e. prevent introductions · alerts – report new occurrences · risk assessment and triage · cataloging control activities – what works? · modeling · CAL-Weed database Shouldn't economic issues also be considered? Monitoring/Information sources - Dept. of Food and Agriculture - Federal framework under NBII (USGS-BRD) - Federal Invasive Species program focusing on pests and diseases (see Tom Stolhgran - Center for Aquatic Non-indigenous Species – UFLA-Gainsville - DOI developing an invasive species office to develop a federal alert system. (See Randy Wessbrook) - An Introduced Species Coordinator will shortly be hired at CDFG – Bay-Delta Branch Regarding 3.1 "New introductions of Non-indigenous plants", currently there is no clearinghouse of non-indigenous species information. Kim Webb has been collecting information informally. Regarding 3.2 "Non-indigenous plants growth, spread, competition", what is meant by "key non-indigenous plant species"? Are these species specifically mentioned in the ERP? Some other definition? Regarding 3.3 "Control efforts for non-indigenous plants where non-native plants have degraded habitat quality", eliminate the phrase "where non-native plants have degraded habitat quality". The rationale must be improved. The results of all control efforts should be tracked, not just CALFED initiated actions. POST-WORKSHOP COMMENT: 3.2 should be expanded to include upland species of trees and grasses that contribute unsuitable habitats for native species.

Table L1. Comment Summary - Landscape level processes, habitats, & biological communities (9/14/01)				
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Workshop & Post-Workshop (labeled) Comments**
BIOTA - CONTAMINANTS (ERP Strategic Objectives 6.1)				
3.4	PRESSURE: Contaminants - Selenium, Mercury, Other	Measuring aquatic toxicity should provide earlier warning and response to changes in contaminant levels than measures in the terrestrial system. We expect that aquatic toxicity measures will be more fully detailed in the aquatic monitoring plan.	Aquatic toxicity measures (fish tissue, benthic invertebrates communities, algal communities)	Yes, contaminants is a landscape wide issue. This monitoring should be linked with the Environmental Water Quality program and Drinking Water Quality Program of CALFED. Also see the ERP white paper on contaminants. Some specific topics that were mentioned · mercury · selenium – both a San Joaquin River and San Francisco Bay problem · grazing impacts (may be regional or local) · pesticides – (UC Davis research suggests that birds may be most sensitive indicators of non-point pollution in the system) · fine sediment (can affect amphibians) · pharmaceuticals, applied contaminants including waste products
3.5	STATE / PRESSURE: Land use practices relative to toxins to terrestrial species	Some specific pesticides or pesticide application practices can be detrimental to terrestrial species such as pesticide drift or granular forms of pesticides that are eaten by waterfowl, etc.	Land use practices relative to toxins to terrestrial species	Land use is an important correlate with contaminants. Concerns were raised about redirected impacts Monitoring/Information Sources · UC Davis is doing some studies regarding contaminants affects on red tailed hawks, kestrels and ospreys. However, the results haven't yet been related to adaptive management decision-making. · EPA & SWRCB, e.g. TMDL, 305 D list · Dept. of Pesticide Regulation · SRWP – organophosphate pesticide program · CAL ECOTOX – From CALEPA, OEHA – compendium on known toxic effects on California wildlife · EPA selenium studies in San Joaquin Valley in grasslands and ag drainages – invertebrates, eggshells, and fish. · Selenium verification study · Selenium Workshop conducted by the Bay Institute Many pesticides don't even have analytical methods to test for their presence. (40/200+)

Table L1. Comment Summary - Landscape level processes, habitats, & biological communities (9/14/01)				
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Workshop & Post-Workshop (labeled) Comments**
3.5 Cont.				Research is needed regarding the affects of pesticides on amphibians and the contribution towards declines in amphibians. Such research would help determine what should be in the monitoring program. Lots of existing data should be analyzed before incorporating more monitoring. Individual species needs may drive additional monitoring for contaminants, i.e. mercury monitoring in clapper rails. 3.8 "Contaminants - Selenium, Mercury, Other" under WATERFOWL should be placed under the contaminants section.
BIOTA - WATERFOWL (ERP Strategic Objectives 1.3, 3.3, 6.1)				
3.6	STATE: Waterfowl	What are the status and trends in waterfowl communities in tidal wetlands? The status of waterfowl directly relates to a CALFED objective.	Winter Waterfowl abundances for key species sensitive species indices of abundance or presence/absence Extent & distribution of habitats preferred by waterfowl Harvest reports by species	Waterfowl can be good landscape indicators because they are very mobile. However not all waterfowl are the same. Some are residents, some are migrants. However, it is important to determine the purpose of the indicator first, and then choose the indicator itself. Regarding 3.6 "Waterfowl", delete the term "winter" before "winter waterfowl abundances". During the summer, waterfowl productivity is more important to measure than abundance. Tie in to the large amount of monitoring that is already occurring. Work is already being done relating waterfowl distribution to habitats and this has been used to influence management practices. Management practices can increase one group of species while decreasing another. For example, water depth influences the species present. The monitoring plan must take into account the different habitat requirements for the different species. The high mobility of waterfowl makes them difficult to monitor. However, just monitoring the extent & distribution of habitats is not sufficient. Monitoring / Information sources · September and midwinter waterfowl surveys – currently the waterfowl community is questioning their value and these surveys may be discontinued since they are not very thorough and representative.
3.7	PRESSURE: Wetland and agricultural land use practices	Land use practices can either provide additional habitat for wildlife species or provide additional pressures. Urbanization increases affects due to non-indigenous pets, recreational disturbance etc.	mapping of wetland and agricultural land use including seasonal wetlands and utility as habitat for waterfowl	
3.8	PRESSURE: Contaminants - Selenium, Mercury, Other	Measuring aquatic toxicity should provide earlier warning and response to changes in contaminant levels than measures in the terrestrial system. We expect that aquatic toxicity measures will be more fully detailed in the aquatic monitoring plan.	*<see 3.4: Aquatic toxicity measures (fish tissue, benthic invertebrates communities, algal communities)>*	

Table L1. Comment Summary - Landscape level processes, habitats, & biological communities (9/14/01)				
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Workshop & Post-Workshop (labeled) Comments**
3.8 Cont.		Restored wetlands may increase mercury methylation, affect fish, waterfowl, and humans consuming contaminated animals	Concentrations of mercury in waterfowl tissue relative to human health concerns	· Breeding ground surveys 3.10 "Conversion of diked wetland habitat to tidal inundation" and 3.11 "Improve wildlife friendly agricultural practices in areas near tidal wetlands"-- These should be worded so they are less specific to tidal areas and instead reflect the aggregate of changes across the landscape. For example "Effect of CALFED influenced land use changes on the extent and distribution of waterfowl habitat, i.e. urbanization, returning diked wetlands to tidal inundation, wildlife friendly agricultural practices, etc.'' Perhaps this could also be combined with 3.7?
3.9	PRESSURE - NATURAL: Disease outbreaks	What disease outbreaks are occuring? Are they exacerbated by overcrowding? Waterfowl disease outbreaks are more likely to occur when waterfowl are overcrowded.	disease outbreaks in region	
3.10	PRESSURE - REDIRECTED: Conversion of diked wetland habitat to tidal inundation	How are waterfowl to changes in the distribution of waterfowl habitat across the landscape? CALFED will be decreasing waterfowl habitat by converting some diked wetlands to tidal wetlands inSuisun Marsh and increasing waterfowl habitat in the Delta and in agricultural lands.	Changes in extent and distribution of habitats preferred by waterfowl Changes in distribution, abundances and habitat use by waterfowl	POST-WORKSHOP COMMENT: An element or two here could be added to address the presence of disturbances such as of high levees, power lines, roads and canals which are known deterents to waterfowl use.

Table L1. Comment Summary - Landscape level processes, habitats, & biological communities (9/14/01)				
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Workshop & Post-Workshop (labeled) Comments**
3.11	ACTION: Improve wildlife friendly agricultural practices in areas near tidal wetlands	ERPP: Improve wildlife friendly agricultural practices in areas near tidal wetlands including * deferring fall tillage until later in year can increase quantity of forage on cornfields for waterfowl and greater sandhill cranes * shallow flooding of seasonal croplands in fall/winter can greatly increase the availability of forage for wintering waterfowl * retaining a percentage of the unharvested crop in the agricultural field would enhance the value of flooding (7)	Location, status, & effectiveness of efforts to improve wildlife friendly agricultural practices near tidal wetlands	
SHOREBIRDS (ERP Strategic Objectives 1.3)				
3.12	STATE: Shorebirds	What are the status and trends in shore bird communities in tidal wetlands? This question directly relates to a CALFED objective. Measuring status and trends in shorebirds can be difficult since they are affected by many factors outside of the ERP focus area. However coordinating with the current regional shorebird surveys is advisable.	Species diversity, richness, eveness; Key indicator species indices of abundance or presence/absence sensitive species indices of abundance or presence/absence Extent & distribution of habitats preferred by shorebirds, esp. extent of tidal mudflats	
3.13	PRESSURE: Contaminants - Selenium, Mercury, Other	Measuring aquatic toxicity should provide earlier warning and response to changes in contaminant levels than measures in the terrestrial system. We expect that aquatic toxicity measures will be more fully detailed in the aquatic monitoring plan.	*<see 3.4: Aquatic toxicity measures (fish tissue, benthic invertebrates communities, algal communities)>*	
3.14	*ACTION: Habitat restoration & enhancement efforts*	*See Attributes 2.3, 2.4, 2.9*	*See Attributes 2.3, 2.4, 2.9*	

Table L1. Comment Summary - Landscape level processes, habitats, & biological communities (9/14/01)				
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Workshop & Post-Workshop (labeled) Comments**
WADING BIRDS (ERP Strategic Objectives 1.3)				
3.15	STATE: Wading birds	What are the status and trends in wading bird communities in tidal wetlands? This question relates to a CALFED objective. Although patch measures of species diversity, key indicator species, etc. can be measured, across the region, location and size of nesting colonies is essential.	Number, location and size of nesting colonies	
			Extent & distribution of habitats preferred by wading birds including agricultural lands	
3.16	PRESSURE: Contaminants - Selenium, Mercury, Other	Measuring aquatic toxicity should provide earlier warning and response to changes in contaminant levels than measures in the terrestrial system. We expect that aquatic toxicity measures will be more fully detailed in the aquatic monitoring plan.	*<see 3.4: Aquatic toxicity measures (fish tissue, benthic invertebrates communities, algal communities)>*	
3.17	*ACTION: Habitat restoration & enhancement efforts*	*See Attributes 2.3, 2.4, 2.9*	*See Attributes 2.3, 2.4, 2.9*	
NEOTROPICAL MIGRATORY BIRDS (ERP Strategic Objectives 1.3)				
3.18	STATE: Neotropical migratory birds	What are the status and trends in neotropical migratory birds?	abundance and distribution of key indicator species	POST-WORKSHOP COMMENT: Add and element to monitor nesting. This will be very labor intensive but nest searches will be important
			MSCS species indices of abundance or presence/absence	
			Extent & distribution of habitats preferred by neotropical migratory birds	

Table L1. Comment Summary - Landscape level processes, habitats, & biological communities (9/14/01)				
No.	**State, Pressure or Action Attribute**	**Rationale**	**Monitoring Element**	**Workshop & Post-Workshop (labeled) Comments**
3.19	PRESSURE: Abundance of brown-headed cowbird	Nest parasitization by brown-headed cowbirds is an important stressor for open-cup neotropical migratory songbirds. Parasitism rates are thought to be decreased in large patch size and increased by proximity to land uses that favor cowbirds.	patch sizes of riparian zones across the landscape	
			land use adjacent to riparian zones, particularly land uses that favor cowbirds (feedlots, etc.)	
3.20	*ACTION: Habitat restoration & enhancement efforts*	*See Attributes 2.3, 2.4, 2.9*	*See Attributes 2.3, 2.4, 2.9*	
OTHER GROUPS (ERP Strategic Objectives 1.3)				
3.21	STATE: Native anurans (frogs & toads)	?	?	This attribute should be kept and reptiles added as well. CALFED may want to consider other measures such as robustness of honey bees which reflect air and water quality.
	Others	?	?	Other Landscape level species and communities-- Blue oak woodlands and perennial grasslands might be good plant communities to assess across the landscape.

Members of TAMP Development Team and Internal Review Team

TAMP Development Team Members (September, 2000)

Andrea Atkinson	USGS
Bellory Fong	CALFED
Carolyn Marn	USGS
Peter Stine (former)	Formerly USGS. Currently U.S. Forest Service

TAMP Internal Review Team Members (September, 2000)

Laurie Briden	CDFG
Randy Brown	DWR
Dennis Bowker	CALFED
Dan Buford	USFWS
Dick Daniel	CALFED
Mike Fris	USFWS
Marti Kie	CALFED
John Lowrie	CALFED
Ray McDowell	CALFED
Terry Mills	CALFED
Anitra Pawley	Bay Institute
Elena Robisch	USFWS
Rick Soehren	CALFED
Larry Smith	USGS
Jo Turner	CALFED
Katie Wadsworth	DWR
Collette Zemitis	DWR

CALFED TAMP Workshop Participants

Name	Organization	Tidal Wetlands 8/30/00	Freshwater & Riparian 9/7/00	Landscape 9/14/00
Andrea Atkinson	USGS	X	X	X
Dennis Bowker	SRWP	X	X	X
Michael Bradbury	DWR & SHTAC	X		
Cathy Brown	USFS			X
Larry Brown	USGS	X		
Randy Brown	CALFED		X	X
Brad Burkholder	DFG-CVBOB		X	X
Scott Cantrell	CDFG			X
Mike Casazza	USGS	X		X
Dave Ceppos	JSA	X	X	X
Wayne Fields	Hydrozoology	X		
Robert Fisher	USGS		X	
Joe Fleskes	USGS			X
Joan Florsheim	UC Davis			X
Bellory Fong	CALFED	X	X	X
Steve Greco	UCD		X	
Geoff Geupel	PRBO		X	
Tom Griggs	CSU Chico		X	
Brad Hall	Northwest Hydraulics	X		
Eddie Hard	USGS	X	X	
Roger Hothem	USGS		X	
Mike Johnson	UC Davis	X		
Todd Keeler-Wolf	DFG		X	
Marti Kie	CALFED	X	X	
Karl Malamud-Roam	UCB & CCMVCD	X		
Carolyn Marn	USGS	X	X	X
Ray McDowell	CALFED	X		
Terry Mills	CALFED			X
Jeffrey Mount	UC Davis		X	
Dennis Murphy	CALFED Interim Sci. Bd.	X	X	
Kent Nelson	DWR-ESO	X	X	
Nadav Nur	PRBO	X		
Anitra Pawley	Bay Institute	X	X	X
Greg Pasternack	UC Davis	X		
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Jim Quinn	UC Davis			X
Rema Sadak	USFS			X
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Larry Smith	USGS	X	X	X
Rick Soehren	CALFED	X		
Jo Turner	CALFED	X	X	X
John Warner	USGS	X		
Nils Warnock	PRBO	X		
Kim Webb	USFWS	X	X	X
Frank Wernette	CDFG	X		

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ACRONYMS

ACOE	Army Corps of Engineers
CALFED	CALFED Bay-Delta Program
CCMVCD	Contra Costa Mosquito Vector Control District
CDFG	California Department of Fish and Game
CMARP	Comprehensive Monitoring Assessment and Research Program
CPIF	California Partners In Flight
CSU	California State University
DFG	California Department of Fish and Game
DWR-ESO	California Department of Water Resources, Environmental Services Office
ERP	CALFED Bay-Delta Program Ecosystem Restoration Program
ISB	CALFED Ecosystem Restoration Program Interim Science Board
JSA	Jones and Stokes, Associates
MSCS	CALFED Multi Species Conservation Strategy
NWR	National Wildlife Refuge
PRBO	Point Reyes Bird Observatory
ROD	CALFED Record of Decision (August, 2000)
TAMP	Terrestrial and Amphibious Monitoring Plan for the CALFED Bay-Delta Program
UCB	University of California at Berkeley
UC Davis	University of California at Davis
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

GLOSSARY

Action - A structure, operating criteria, program, regulation, policy, or restoration activity that is intended to address a problem or resolve a conflict in the Bay-Delta system

Adaptive Management - An action-oriented approach to resource management that brings science and management together and allows managers to move forward in the face of uncertainty when dealing with complex ecological problems. Adaptive management tackles uncertainty about the system head-on by identifying clear objectives, developing conceptual models of the system, identifying areas of uncertainty and alternative hypotheses, learning from the system as actions are taken to manage it, updating the conceptual models, and incorporating what is learned into future actions.

Attribute - A biological or physical feature of the ecosystem that depicts function, structure, or composition of that system.

Baseline Monitoring - Monitoring to document the status and trends of resource conditions; in the context of CALFED, to evaluate whether the goals and objectives of the program are being achieved.

CMARP - a joint *San Francisco Estuary Institute, Interagency Ecological Program, U.S. Geological Survey* directed effort to develop a Comprehensive Monitoring, Assessment, and Research Program (CMARP) for CALFED. CMARP developed monitoring and research recommendations for CALFED programs involving 30 technical teams comprised of more than 250 agency and stakeholder representatives. The technical appendix, completed in March 1999, and subsequently a draft technical appendix of the Revised Draft Programmatic EIS/EIR in June 1999, is available at: http://www.calfed.water.ca.gov/environmental_docs/july2000_eis.html
CMARP evolved into the CALFED Science Program; its purpose is to provide new information and scientific interpretations necessary to implement, monitor, and evaluate the success of the CALFED Program.

Conceptual Model - (1) "Explicit statements of the hypothesized functional relationships underlying management decisions regarding environmental resources." [A Proposal for the Development of a Comprehensive Monitoring Assessment and Research Program, April 24, 1998, page 30]; (2) "A simple non-quantitative model, developed for the purpose of building a consensus regarding the most important ecological elements and linkages that characterize a stressed ecosystem." [Nick Aumen, Conceptual Modeling Workshop, UC Davis, June 17-18, 1998]

Ecological Process - Ecological processes act directly, indirectly, or in combination, to shape and form the ecosystem. These include streamflow, watershed (closely linked to streamflow; includes fire and erosion), stream channel (includes stream meander, gravel recruitment and transport, water temperature, and hydraulic conditions), and floodplain processes (include overbank flooding and sediment retention and deposition). [Ecosystem Restoration Program Plan, March 1999]

Ecological Management Zone - The primary geographic focus area for the Ecosystem Restoration Program Plan includes 14 zones, each characterized by a predominant physical habitat type and species assemblage: American River Basin, Butte Basin, Colusa Basin, Cottonwood Creek, East San Joaquin Basin, Eastside Delta Tributaries, Feather River/Sutter Basin, North Sacramento Valley, Sacramento River, Sacramento-San Joaquin Delta, San Joaquin River, Suisun Marsh/North San Francisco Bay, West San Joaquin Basin, Yolo Basin [Ecosystem Restoration Program Plan]

Ecosystem - A recognizable, relatively homogeneous unit that includes organisms, their environment, and all the interactions among them

ERP White Paper Process - an ongoing process to document the issue-oriented conceptual models and their implications for restoration actions in a series of white papers. White paper authors are using the CMARP conceptual models to help develop the issue-oriented conceptual models relevant to some of the key ecosystem restoration issues. These include fluvial geomorphology, riparian habitat and avifauna, tidal wetlands, aquatic contaminants, open water processes, salmonids, delta smelt, splittail, diversion effects on fish and the Environmental Water Account, and delta agricultural diversions.

GIS - A geographic information system (GIS) is a computer-based tool for mapping and analyzing things that exist and events that happen on earth. GIS technology integrates common database operations such as query and statistical analysis with the unique visualization and geographic analysis benefits offered by maps.

Habitats - Areas that provide specific conditions necessary to support plant, fish, and wildlife communities. Habitat elements identified in the Ecosystem Restoration Program Plan include tidal perennial aquatic habitat, nontidal perennial aquatic habitat, delta sloughs, midchannel islands and shoals, saline emergent wetland, fresh emergent wetland, seasonal wetlands, riparian and riverine aquatic habitats, inland dune scrub habitat, perennial grassland, agricultural lands, freshwater fish habitat, and essential fish habitat

Habitat Quality - Biological and physical conditions of habitat (e.g. vegetation structure, species composition, water quality, substrate composition, rate of deposition, etc.) that reflect the ability to support native biota.

Indicators - Features or attributes of the system that are expected to change over time in response to implementation of CALFED. “Indicators are selected to provide measurable evaluations of important ecological processes, habitats, and species whose status individually and cumulatively provide an assessment of ecological health. Indicators of ecosystem health are the gauges we will use to measure progress toward the goal." [Ecosystem Restoration Program Plan, March 1999]

“m” Species - The goal assigned to species that expected to be minimally affected by CALFED actions. For this category, CALFED will mitigate any adverse effects to the species commensurate with the level of effect on the species; thus, actions may not actually contribute to the recovery of the species, but would be expected, at a minimum, to not contribute to the need to list a species or degrade the status of a listed species. CALFED will also maximize beneficial effects on these species to the extent practicable.

MSCS - The CALFED Program was established to reduce conflicts in the Bay-Delta system by solving problems in ecosystem quality, water quality, water supply reliability, and levee system integrity. Implementing these actions will have a complex range of effects, including impacts to plants and animals listed under the Federal Endangered Species Act (ESA) and the California Endangered Species Act (CESA) and other sensitive species. The Multi-species Conservation Strategy (MSCS) builds on the Ecosystem Restoration Program (ERP) to provide a framework for compliance with the ESA, CESA, and a second California law also dealing with listed species, the Natural Community Conservation Planning Act (NCCPA).
http://www.calfed.water.ca.gov/environmental_docs/july2000_eis.html

Monitoring - Regular measurement of attributes of interest through time. In ecosystem restoration, monitoring is the process of measuring the abundance, distribution, change or status of indicators. This will allow progress to be measured, allow actions to be modified if necessary and provide assurances that the restoration objectives are being achieved

Monitoring Element - Any living or non-living feature or attribute of the biophysical environment that can be measured or estimated that will provide some insight into accomplishment of CALFED goals and objectives.

NCCP Habitat Categories - Natural Community Conservation Plan Habitat definitions. The Multi-Species Conservation Strategy (MSCS) has adopted the NCCP classification of natural communities including 18 habitat types and 2 ecologically-based fish groups. The 18 habitat types are broad habitat categories, each of which include a number of habitat or vegetation types recognized in frequently used classification systems (tidal perennial aquatic, valley riverine aquatic, montane riverine aquatic, lacustrine, saline emergent, tidal freshwater emergent, nontidal freshwater permanent emergent, natural seasonal wetlands, managed seasonal wetlands, valley/foothill riparian, montane riparian, grassland, inland dune scrub, upland scrub, valley/foothill woodland and forest, montane woodland and forest, upland cropland, seasonally flooded agriculture). [Multi-Species Conservation Strategy, June 1999, p.2-2 to 2-5]

Non-Indigenous Species - Also called exotic or introduced species. Plants and animals that originate elsewhere and migrate or are brought into an area. They may dominate the local species or have other negative impacts on the environment

Pressure - Natural and unnatural events or activities that adversely affect ecosystem processes, habitats and species. These include water diversions, dams, reservoirs,

weirs, and other structures, levees, bridges and bank protection, dredging and sediment disposal, gravel mining, invasive aquatic plants, invasive aquatic organisms, invasive riparian and salt marsh plants, non-native wildlife, predation and competition, contaminants, wildfire, fish and wildlife harvest, artificial fish propagation, and disturbance. We use this term as a more inclusive term than the term stressors [Ecosystem Restoration Program Plan, vol. 1, page 5], to include the full array of direct and indirect activities that could affect any attribute of the system.

"R" Species – The goal assigned to those species whose range is entirely or nearly entirely within the MSCS Focus Area affected by the CALFED Program and for which CALFED could reasonably be expected to undertake all or most of the actions necessary to recover the species. The term recover means the decline of a species is arrested or reversed, threats to the species are neutralized, and thus, the species' long-term survival in nature is assured.

"r" Species - The goal assigned to those species for which CALFED Program actions affect only a limited portion of the species range and/or CALFED Program actions have limited effects on the species. A goal of contributing to a species' recovery implies that CALFED will undertake some of the actions under its control within its MSCS Focus Area and Program scope necessary to recover the species.

Redirected Effect - A response of an attribute of the system that results from some directed management action. Responses resulting from one CALFED Program Management Action can affect other CALFED Programs through redirected effects.

Riparian - The strip of land adjacent to a natural water course such as a river or stream. Often supports vegetation that provides the best fish habitat values when growing large enough to overhang the bank

Riverine - Habitat within or alongside a river or channel

Species and Species Groups - "Certain species or groups of species are given particular attention in the ERPP. This focus is based on three criteria that might be met by a species: 1) it is threatened, endangered, or a species of special concern; 2) it is economically important, supporting a sport or commercial fishery; or 3) it is an important prey species" [Ecosystem Restoration Program Plan, March 1999]

State of Ecosystem - The integrated manifestation of ecological processes, biological composition, ecological function, and rates of change that result in the condition of the system at any given time.

Strategic Plan - Provides the conceptual framework and process that will guide the refinement, evaluation, prioritization, implementation, monitoring and revision of CALFED's Ecosystem Restoration Program [Strategic Plan for Ecosystem Restoration, July 2000]. http://www.calfed.water.ca.gov/environmental_docs/july2000_eis.html

Terrestrial - Types of species of animal and plant wildlife that live on or grow from the land.

Tidal Wetlands - Shallow water habitats with substrate exposed and flooded by tides; includes classes: Rock Bottom, Unconsolidated Bottom, Aquatic Bed, Streambed, Rocky Shore, Unconsolidated Shore, Emergent Wetland, Scrub-Shrub Wetland, and Forested Wetland.

Watershed - An area that drains ultimately to a particular channel or river, usually bounded peripherally by a natural divide of some kind such as a hill, ridge, or mountain.

APPENDIX A:
CALFED ECOSYSTEM RESTORATION PROGRAM
STRATEGIC GOALS & OBJECTIVES (May 2000)

Goal 1: Endangered and Other At-risk Species and Native Biotic Communities

Achieve recovery of at-risk native species dependent on the Delta and Suisun Bay as the first step toward establishing large, self-sustaining populations of these species; support similar recover of at-risk native species in San Francisco Bay and the watershed above the estuary; and minimize the need for future endangered species listings by reversing downward population trends of native species that are not listed.

Objective 1: Achieve, first, recovery and then large self-sustaining populations of the following at-risk native species dependent on the Delta, Suisun Bay, and Suisun Marsh: Central Valley winter-, spring- and fall/late fall-run chinook salmon ESUs, Central Valley steelhead ESU, delta smelt, longfin smelt, Sacramento splittail, green sturgeon, valley elderberry longhorn beetle, Suisun ornate shrew, Suisun song sparrow, soft bird's-beak, Suisun thistle, Mason's lilaeopsis, San Pablo song sparrow, Lange's metalmark butterfly, Antioch Dunes evening primrose, Contra Costa wallflower, and Suisun marsh aster.

Objective 2: Contribute to the recovery of the following at-risk native species in the Bay-Delta estuary and its watershed: Sacramento perch, delta green ground beetle, giant garter snake, salt marsh harvest mouse, riparian brush rabbit, San Pablo California vole, San Joaquin Valley woodrat, least Bell's vireo, California clapper rail, California black rail, little willow flycatcher, bank swallow, western yellow-billed cuckoo, greater sandhill crane, Swainson's hawk, California yellow warbler, salt marsh common yellowthroat, Crampton's tuctoria, Northern California black walnut, delta tule pea, delta mudwort, bristly sedge, delta coyote thistle, alkali milkvetch, and Point Reyes bird's-beak.

Objective 3: Enhance and/or conserve native biotic communities in the Bay-Delta estuary and its watershed, including the abundance and distribution of the following biotic assemblages and communities: native resident estuarine and freshwater fish assemblages, anadromous lampreys, neotropical migratory birds, wading birds, shore birds, waterfowl, native anuran amphibians, estuarine plankton assemblages, estuarine and freshwater marsh plant communities, riparian plant communities, seasonal wetland plant communities, vernal pool communities, aquatic plant communities, and terrestrial biotic assemblages associated with aquatic and wetland habitats.

Objective 4: Maintain the abundance and distribution of the following species: hardhead,western least bittern, California tiger salamander, western spadefoot toad, California red-legged frog, western pond turtle, California freshwater shrimp, recurved larkspur, mad-dog skullcap, rose-mallow, eel-grass pondweed, colusa grass, Boggs Lake hedge-hyssop, Contra Costa goldfields, Greene's legenere, heartscale, and other species designated "maintain" in the Multi-Species Conservation Strategy.

Goal 2: Ecological Processes

Rehabilitate natural processes in the Bay-Delta estuary and its watershed to fully support, with minimal ongoing human intervention, natural aquatic and associated terrestrial biotic communities and habitats, in ways that favor native members of those communities.

Objective 1: Establish and maintain hydrologic and hydrodynamic regimes for the Bay and Delta that support the recovery and restoration of native species and biotic communities, support the restoration and maintenance of functional natural habitats, and maintain harvestable species.

Objective 2: Increase estuarine productivity and rehabilitate estuarine food web processes to support the recovery and restoration of native estuarine species and biotic communities.

Objective 3: Rehabilitate natural processes to create and maintain complex channel morphology, in-channel islands, and shallow water habitat in the Delta and Suisun Marsh.

Objective 4: Create and/or maintain flow and temperature regimes in rivers that support the recovery and restoration of native aquatic species.

Objective 5: Establish hydrologic regimes in streams, including sufficient flow timing, magnitude, duration, and high flow frequency, to maintain channel and sediment conditions supporting the recovery and restoration of native aquatic and riparian species and biotic communities.

Objective 6: Reestablish floodplain inundation and channel-floodplain connectivity of sufficient frequency, timing, duration, and magnitude to support the restoration and maintenance of functional natural floodplain, riparian, and riverine habitats.

Objective 7: Restore coarse sediment supplies to sediment-starved rivers downstream of reservoirs to support the restoration and maintenance of functional natural riverine habitats.

Objective 8: Increase the extent of freely meandering reaches and other pre-1850 river channel forms to support the restoration and maintenance of functional natural riverine, riparian, and floodplain habitats.

Goal 3: Harvestable Species

Maintain and/or enhance populations of selected species for sustainable commercial and recreational harvest, consistent with the other ERP strategic goals.

Objective 1: Enhance fisheries for salmonids, white sturgeon, pacific herring, and native cyprinid fishes.

Objective 2: Maintain, to the extent consistent with ERP goals, fisheries for striped bass, American shad, signal crayfish, grass shrimp, and nonnative warmwater gamefishes.

Objective 3: Enhance, to the extent consistent with ERP goals, populations of waterfowl and upland game for harvest by hunting and for non-consumptive recreation.

Objective 4: Ensure that chinook salmon, steelhead, trout, and striped bass hatchery, rearing, and planting programs do not have detrimental effects on wild populations of native fish species and ERP actions.

Goal 4: Habitats

Protect and/or restore functional habitat types in the Bay-Delta estuary and its watershed for ecological and public values such as supporting species and biotic communities, ecological processes, recreation, scientific research, and aesthetics.

Objective 1: Restore large expanses of all major habitat types, and sufficient connectivity among habitats, in the Delta, Suisun Bay, Suisun Marsh, and San Francisco Bay to support recovery and restoration of native species and biotic communities and rehabilitation of ecological processes. These habitat types include tidal marsh (fresh, brackish, and saline), tidal perennial aquatic (including shallow water and tide flats), nontidal perennial aquatic, tidal sloughs, midchannel island and shoal, seasonal wetlands, riparian and shaded riverine aquatic, inland dune scrub, upland scrub, and perennial grasslands.

Objective 2: Restore large expanses of all major aquatic, wetland, and riparian habitats, and sufficient connectivity among habitats, in the Central Valley and its rivers to support recovery and restoration of native species and biotic communities and rehabilitation of ecological processes. These habitat types include riparian and shaded riverine aquatic, instream, fresh emergent wetlands, seasonal wetlands, other floodplain habitats, lacustrine, and other freshwater fish habitats.

Objective 3: Protect tracts of existing high quality major aquatic, wetland, and riparian habitat types, and sufficient connectivity among habitats, in the Bay-Delta estuary and its watershed to support recovery and restoration of native species and biotic communities, rehabilitation of ecological processes, and public value functions.

Objective 4: Minimize the conversion of agricultural land to urban and suburban uses and maintain open space buffers in areas adjacent to existing and future restored aquatic, riparian, and wetland habitats, and manage agricultural lands in ways that are favorable to birds and other wildlife.

Objective 5: Manage the Yolo and Sutter Bypasses as major areas of seasonal shallow water habitat to enhance native fish and wildlife, consistent with CALFED Program objectives and solution principles.

Goal 5: Nonnative Invasive Species

Prevent the establishment of additional non-native invasive species and reduce the negative ecological and economic impacts of established non-native species in the Bay-Delta estuary and its watershed.

Objective 1: Eliminate further introductions of new species from the ballast water of ships into the Bay-Delta estuary.

Objective 2: Eliminate further introductions of new species from imported marine and freshwater baits into the Bay-Delta estuary and its watershed.

Objective 3: Halt the unauthorized introduction and spread of potentially harmful non-native introduced species of fish or other aquatic organisms in the Bay-Delta and Central Valley.

Objective 4: Halt the release of non-native introduced fish and other aquatic organisms from private aquaculture operations and the aquarium and pet trades into the Bay-Delta estuary, its watershed, and other California waters.

Objective 5: Halt the introduction of non-native invasive aquatic and terrestrial plants into the Bay-Delta estuary, its watershed, and other central California waters.

Objective 6: Reduce the impact of non-native mammals on native birds, mammals, and other organisms.

Objective 7: Limit the spread or, when possible and appropriate, eradicate populations of non-native invasive species through focused management efforts.

Objective 8: Prevent the invasion of the zebra mussel into California.

Goal 6: Water and Sediment Quality

Improve and/or maintain water and sediment quality conditions that fully support healthy and diverse aquatic ecosystems in the Bay-Delta estuary and watershed; and eliminate, to the extent possible, toxic impacts to aquatic organisms, wildlife, and people.

Objective 1: Reduce the loadings and concentrations of toxic contaminants in all aquatic environments in the Bay-Delta estuary and watershed to levels that do not adversely affect aquatic organisms, wildlife, and human health.

Objective 2: Reduce loadings of oxygen-depleting substances from human activities into aquatic ecosystems in the Bay-Delta estuary and watershed to levels that do not cause adverse ecological effects.

Objective 3: Reduce fine sediment loadings from human activities into rivers and streams to levels that do not cause adverse ecological effects.

APPENDIX B: ERP at-risk species & biological communities

RECOVER (R):

Birds: Suisun song sparrow, San Pablo song sparrow,
Fish: Central Valley winter-, spring- and fall/late fall-run chinook salmon ESUs, Central Valley steelhead ESU, delta smelt, longfin smelt, Sacramento splittail, green sturgeon:
Invertebrates: Valley elderberry longhorn beetle, Lange's metalmark butterfly;
Mammals: Suisun ornate shrew;
Plants: Soft bird's-beak, Suisun thistle, Mason's lilaeopsis, Antioch Dunes evening primrose, Contra Costa wallflower, and Suisun marsh aster.

CONTRIBUTE TO RECOVERY (r):

Birds: least Bell's vireo, California clapper rail, California black rail, little willow flycatcher, bank swallow, western yellow-billed cuckoo, greater sandhill crane, Swainson's hawk, California yellow warbler, salt marsh common yellowthroat;
Fish: Sacramento perch;
Invertebrates: delta green ground beetle;
Mammals: salt marsh harvest mouse, riparian brush rabbit, San Pablo California vole, San Joaquin Valley woodrat;
Plants: Crampton's tuctoria, Northern California black walnut, delta tule pea, delta mudwort, bristly sedge, delta coyote thistle, alkali milkvetch, and Point Reyes bird's-beak;
Reptiles: giant garter snake

MAINTAIN (m):

Amphibians (6): California Red Legged Frog, California Tiger Salamander, Foothill yellow-legged frog, Limestone salamander, Shasta salamander, Western Spadefoot Toad
Birds (30): Aleutian Canada goose, American peregrine falcon, Bald eagle, Black tern, Black-crowned night heron, California brown pelican, California condor, California gull, California least tern, Cooper's hawk, Double-crested cormorant, Golden eagle, Grasshopper sparrow, Great blue heron, Great egret, Long-billed curlew, Long-eared owl, Mountain plover, Northern harrier, Northern spotted owl, Osprey, Short-eared owl, Snowy egret rookeries, tricolored blackbird, Western burrowing owl, Western least bittern, Western snowy plover, White-faced ibis, White-tailed kite, Yellow-breasted chat
Fish (3): Hardhead, Rough sculpin, Tidewater goby
Invertebrates (9): California Freshwater Shrimp, Conservancy fairy shrimp, Longhorn fairy shrimp, Mid-valley fairy shrimp, Vernal pool fairy shrimp, Vernal pool tadpole shrimp, Callippe silverspot butterfly, Monarch butterfly (roost), Shasta sideband (terrestrial mollusc)
Mammals (7): California Wolverine, Giant kangaroo rat, Greater western mastiff-bat, Merced kangaroo rat, Nelson's antelope ground squirrel, Ringtail, San Joaquin kit fox
Plants (139): Adobe-lily, Ahart's dwarf rush, Ahart's paronychia, Arburua Ranch jewelflower, Baker's larkspur, Baker's manzanita, Beaked clarkia, Bellinger's meadowfoam, Ben Lomond buckwheat, Big Bear Valley woollypod, Big tarplant, Boggs Lake hedge-hyssop, Brandegee's eriastrum, Brewer's western flax, Brittlescale, Butte County meadowfoam, California beaked-rush, California seablite, California vervain, Calistoga popcornflower, Carquinez goldenbush, Chinese Camp brodiaea, Clara Hunt's milk-vetch, Colusa grass, Congdon's lomatium, Congdon's tarplant, Contra Costa goldfields, Contra Costa manzanita, Diablo helianthella, Diamond-petaled California poppy, Dimorphic snapdragon, Drymaria-like western flax, Dwarf soaproot, Eel-grass pondweed, El Dorado bedstraw, English peak greenbriar, Ferris's milk-vetch, Few-flowered navarretia, Four-angled spikerush, Greene's tuctoria, Hairy orcutt grass, Hall's bush mallow, Hall's tarplant, Hartweg's golden sunburst, Heartscale, Heckard's

peppergrass, Henderson's bent grass, Hispid bird's-beak, Hoover's eriastrum, Hoover's spurge, Hospital Canyon larkspur, Indian Valley brodiaea, Ione buckwheat, Ione manzanita, Irish Hill buckwheat, Jepson's milk-vetch, Kenwood Marsh checkerbloom, Klamath manzanita, Large-flowered fiddleneck, Layne's ragwort, Legenere, Lesser saltscale, Loch Lomond button-celery, Lost Hills crownscale, Mad-dog skullcap, Madera linanthus, Many-flowered navarretia, Marin checkerbloom, Marin knotweed, Marin western flax, Mariposa clarkia, Marsh checkerbloom, Marsh skullcap, Mason's ceanothus, Merced phacelia, Most beautiful jewel-flower, Mt. Diablo bird's-beak, Mt. Diablo fairy-lantern, Mt. Diablo jewelflower, Mt. Diablo manzanita, Mt. Diablo phacelia, Mt. Hamilton coreopsis, Mt. Hamilton jewelflower, Mt. Tedoc linanthus, Napa blue grass, Napa western flax, North Coast semaphore grass, Pale-yellow layia, Pallid manzanita, Palmate-bracted bird's-beak, Panoche peppergrass, Parry's horkelia, Pincushion navarretia, Pine Hill ceanothus, Pine Hill flannelbush, Pitkin Marsh lily, Rawhide Hill onion, Recurved larkspur, Red Hills ragwort, Red-flowered lotus, Rock sanicle, Rose mallow, Sacramento orcutt grass, San Antonio Hills monardella, San Benito evening-primrose, San Joaquin adobe sunburst, San Joaquin spearscale, San Joaquin Valley orcutt grass, San Joaquin woolythreads, Sanford's arrowhead, Santa Cruz tarplant, Saw-toothed lewisia, Sebastopol meadowfoam, Shaggyhair lupine, Sharsmith's harebell, Sharsmith's onion, Shasta clarkia, Shasta snow-wreath, Showy Indian clover, Showy madia, Silky cryptantha, Slender orcutt grass, Slough thistle, Sonoma alopecurus, Sonoma spineflower, Sonoma sunshine, Spiny-sepaled button-celery, Stebbins' morning-glory, Succulent owl's-clover, Tehama County western flax, Thread-leaved beardtongue, Tiburon Indian paintbrush, Tiburon jewelflower, Tiburon Mariposa lily, Tree-anemone, Vernal Pool smallscale, White sedge, White-rayed pentachaeta, Yellow larkspur
Reptiles (4): Alameda Whip Snake, Blunt-nosed leopard lizard, San Joaquin Whipsnake, Western Pond Turtle

ENHANCE AND/OR CONSERVE: Native resident estuarine and freshwater fish assemblages, anadromous lampreys, neotropical migratory birds, wading birds, shore birds, waterfowl, native anuran amphibians, estuarine plankton assemblages, estuarine and freshwater marsh plant communities, riparian plant communities, seasonal wetland plant communities, vernal pool communities, aquatic plant communities, and terrestrial biotic assemblages associated with aquatic and wetland habitats.

MAINTAIN AND/OR ENHANCE HARVESTED SPECIES: Salmonids, white surgeon, pacific herring, native cyprinid fishes, striped bass, American shad, signal crayfish, grass shrimp, non-native warmwater gamefish, waterfowl, upland game.

APPENDIX C: Draft List of Sources of Information and Monitoring Programs relevant to TAMP

	Agency/ Organization	Monitoring Program	Monitoring Information	Web Page	Contact
1	16 State and federal agencies	California Noxious Weed Control Projects Inventory (CNWCPI) Database	Who is controlling what weeds by what methods (database)	http://endeavor.des.ucdavis.edu/weeds	Kevin Ward kcward@ucdavis.edu
2	Army Corps of Engineers	Habitat Restoration Feasibility Studies	Ecological data	http://www.spk.usace.army.mil/civ/civ.html	Lena Hsia, Miki Fujitsubo
3	Army Corps of Engineers	Sacramento and San Joaquin River Basins Comprehensive Study	Topographic and bathymetric data for Sac. and SJR systems; habitat extent, GIS	http://www.spk.usace.army.mil/civ/ssj	Project Team (916) 557-5140 Compstudy@spk.usace.army.mil
4	Audubon	Audubon Christmas Bird Count	Mid-winter bird population data	http://birdsource.cornell.edu/	
5	Avocet Research Associates for SF Bay NWR?	California Black and Clapper Rail Monitoring	Breeding surveys in SF Bay, more focused on North Bay		jevens@svn.net
6	CA Dept. of Fish and Game	Annual waterfowl counts	Waterfowl counts	Not on web	Dan Yparraguiree (653-8709)
7	CA Dept. of Food and Ag.	Integrated Pest Control Branch surveys	Weed surveys, classification of noxious weeds	http://www.cdfa.ca.gov/plant/ipc/index.html	Steve Schoenig (sschoenig@cdfa.ca.gov)
8	CA Dept. of Water Resources and DFG	(AB360) Delta Levee Maintenance Subventions Program	Levee related habitat assessments in Delta and Suisun Marsh, GIS data	http://wwwdpla.water.ca.gov/cd/flood_gis/habitat.html	Curt Schmutte
9	Cal.Dept. of Pesticide Regulation		Water quality		
10	CALTRANS	GIS group			
11	Central Valley Project Improvement Act	Section 7: land retirement, conservation program			land retirement: Bea Olsen, FWS employee at USBR's Fresno Office: 559-487-5104; conservation program: chuck solomom, USBR, here in the Fed bldg; and Marie Sullivan USFWS, 414-6600

	Agency/ Organization	Monitoring Program	Monitoring Information	Web Page	Contact
12	Cosumnes River Preserve & UC Davis Pred	Cosumnes River Preserve	Vernal pool vegetation communities + contracts to monitor songbirds, rare plants on levees, giant garter snakes		Valerie Calegari (sp?) 916-683-1703 ggeupel@prbo.org
13	Cypress Grove Preserve	Heron and Egret Nest Monitoring	Monitoring on West Marin Island		John Kelly Audubon Canyon Ranch 415-663-8203
14	DFG	Bank Swallow Monitoring	Studies and annual breeding population monitoring since 1996		Ron Schlorff RSchlorf@dfg.ca.gov
15	DFG	Greater Sandhill Crane Monitoring	Breeding and wintering ground studies and monitoring since 1978		Ron Schlorff RSchlorf@dfg.ca.gov
16	DFG	Inventory and Assessment of Vernal Pool/Wetland Habitats in CA	Information on Vernal Pools and other wetlands through out CA, GIS	http://maphost.dfg.ca.gov/wetlands/	
17	DFG	Little Willow Flycatcher Monitoring	Studies and monitoring since 1982		Ron Schlorff RSchlorf@dfg.ca.gov
18	DFG	Natural Diversity Data Base (NDDB)	Rare plants, animals, and natural communities, GIS data	http:///www.dfg.ca.gov/whdab/cnddb.htm	Ken Hashagen, Coordinator Order info:(916)324-3812 Joe Carboni (324-1414)
19	DFG	Riparian Brush Rabbit Monitoring	Population and genetics research and captive breeding program		Ron Schlorff RSchlorf@dfg.ca.gov
20	DFG	Suisun Marsh Vegetation Survey	Annual Vegetation survey (aerial surveys and groundtruthing)		1briden@delta.dfg.ca.gov
21	DFG	Swainson's Hawk Monitoring	Population monitoring and ecological and telemetry studies since 1979		Ron Schlorff RSchlorf@dfg.ca.gov
22	DFG	Swainson's Hawk Monitoring	Population monitoring since 1983 in Yolo County		Jim Estep JimE@jsanet.com
23	DFG	Wildlife Habitat Relationships Database (CWHR)	Amphibians, reptiles, birds and mammals, and habitat types, GIS data	http://www.dfg.ca.gov/whdab/cwhr/whrintro.html	Monica Parisi (916)327-8822 mparisi@dfg.ca.gov
24	DFG	Suisun Marsh Monitoring Program Annual Waterfowl Counts	Waterfowl abundance surveys (monthly aerial surveys in winter on hunt days)		Wildlife Programs Branch
25	DFG/DWR	Suisun Marsh Salt Marsh Harvest Mouse and Trapping	SMHM Conservation Areas and Trapping Annually		Laurie Briden, CDFG lbriden@delta.dfg.ca.gov

	Agency/ Organization	Monitoring Program	Monitoring Information	Web Page	Contact
26	DWR	California Irrigation Management Information System (CIMIS)	Climatological data at >100 stations in CA, data available electronically	http://wwwdpla.water.ca.gov/cgi-bin/cimis/main.pl	Simon Eching
27	DWR	Delta Atlas	Peat thickness estimates in Delta		
28	DWR	Delta Field Division informal Red-legged frog surveys	Only informal presence/absence		Jennifer Hogan 227-7528 jhogan@water.ca.gov
29	DWR	Division of Planning and Local Assistance Water Plan (Bulletin 160 Surveys)	Land use data	http://www.dpla.water.ca.gov/cd/landwateruse	Ed Morris (CD) emorris@water.ca.gov
30	DWR	Water and Environmental Monitoring Program	Flow, water quality (EC and temp.) data; available near real-time from CDEC	http://wwwdwr.water.ca.gov/dwrfloodupdate/Media_CDEC-gages-intro.html	
31	DWR Northern District	Sacramento River Riparian Habitat Program, Sacramento River Atlas Project	Orthophoto mosaic of the Sac River corridor from Red Bluff to Colusa, conceptual riparian habitat management plan	Webpage not up yet	
32	DWR/USGS	Subsidence Research	Peat thickness and subsidence rates		Curt Schmutte, Steve Deverel
33	East Bay Municipal Utility District	Mokelumne River Watershed Wildlife Monitoring Program	Brush Rabbit, Foothill Yellow-legged Frog, Giant Garter Snake, Red-legged Frog, Swainson's Hawk, Willow Flycatcher	http://endeavor.des.ucdavis.edu/CERPI/ProjectDescription.asp?ProjectPK=5282	Kent Reeves East Bay Municipal Utility District kreeves@ebmud.com (209) 333-2095
34	ICE and US Man and Biosphere (USMAB)	MAB Flora and MAB Fauna databases	Vascular plant and vertebrate animal data from biosphere reserves and other protected areas including state and national parks	http://ice.ucdavis.edu/mab/	U.S. MAB Secretariat, OES/ETC/MAB, Department of State, Washington, DC 20522-4401
35	Jones and Stokes for Contra Costa, Los Vaqueros Reservoir	Los Vaqueros	Redlegged frog surveys and more?		Stephanie Myers, JSA Bob Eckart, USBR in the Federal Bldg on Cottage Way, and Jones and Stokes
36	Many	Team Arundo Del Norte	Arrundo monitoring (selective?)	http://ceres.ca.gov/tadn/	Richard Dale (707) 996-9744 sec@vom.com

	Agency/ Organization	Monitoring Program	Monitoring Information	Web Page	Contact
37	Marin Audubon Society (funded by CALFED)	Petaluma Marsh Expansion Project - Marin County	fish and bird use (including San Pablo Song Sparrow, Black and California Clapper Rail), sedimentation, channel formation, and recolonization of vegetation	http://endeavor.des.ucdavis.edu/nrpi/WPIProjectDescription.asp?ProjectPK=5146	Barbara Salzman, Marin Audubon Society, (415) 924-6057
38	Mosquito Abatement Districts		Research on vegetation (including wetlands) and mosquito management		
39	Natomas Basin Conservancy?	Natomas Basin Habitat Conservation Plan			John Roberts, Director of the Natomas Basin Conservancy 916/566-6544
40	NOAA	National Geodetic Survey Federal Base Network	Geographical data	http://www.ngs.noaa.gov/	
41	NOAA National Weather Service	Rain Gage Stations	Precipitation and river level gages; forecasts	http://www.ngs.noaa.gov/	
42	Point Reyes Bird Observatory	Central Valley Surveys Tidal	Bird info. May-July Sac. River, SJR, and Consumnes	http://www.prbo.org	Nadav Nur
43	PRBO & Partners	California Partners in Flight	Standardize monitoring of Passerines	http://www.prbo.org http://www.rsl.psw.fs.fed.us/pif/	Geoff Geupel ggeupel@prbo.org
44	PRBO/TNC/ USFWS	Sacramento River Bird Conservation Project	Riparian Birds	www.prbo.org	Stacy Small ssmall@prbo.org
45	PRBO/USFWS	San Joaquin Restoration	Riparian Birds	www.prbo.org	Geoff Geupel ggeupel@prbo.org
46	Reclamation Districts	Levee Maintenance Flood Fighting	Levee conditions, flooding		
47	Riparian Habitat Joint Venture		Birdbanding actually done by PBRO?	http://ceres.ca.gov/biodiv/newsletter/v6n1/riparian.htm	Lyann Comrack lcomrack@audubon.org
48	Sacramento County Water Agency	Section 7			Peter Morse, Sac. Co. Planning Dept
49	Sacramento River Watershed Program	Water Quality Monitoring & Benthic Invertebrates	Including the Sacramento River Toxic Pollutant Control Program & Other Tributary Monitoring	http://www.SacRiver.org/	Tom Grovhoug, Larry Walker and Associates, (530) 753-6400 tomg@lwadavis.com
50	San Francisco Bay Bird Observatory	Coyote Creek Land Bird Banding Program	Banding and other avian information on their sites on Coyote Creek	http://www.sfbbo.org/	Janet Hanson, Executive Director

	Agency/ Organization	Monitoring Program	Monitoring Information	Web Page	Contact
51	San Francisco Bay National Estuarine Research Reserve			National Estuarine Research Reserve webpage: http://www.nos.noaa.gov/OCRM/nerr/	
52	San Francisco Estuary Institute	Bay Area EcoAtlas	Habitat, vegetation, and wildlife info, GIS	http://www.sfei.org/ecoatlas/index.html	
53	San Joaquin County ?	San Joaquin County Habitat Conservation Plan			AmyAugustine, private consultant, 209/532-7376
54	San Joaquin Valley Endangered Species Program (CSU-Stanislaus)	Riparian Brush Rabbit and San Joaquin Woodrat Monitoring	Monitoring at Caswell Memorial State Park and other places		Laurissa Hamilton lhamilton@esrp.org 209-667-3550 Dan Williams dwilliam@toto.csustan.edu
55	SF Bay Bird Observatory	Colonial Waterbird Monitoring	Breeding populations surveys and reproductive success in SF Bay		Doug Bell 408/946-9648 dbell@sfbbo.org
56	SFEI	Biological Invasions Program	Research on invasive species in the estuary	http://www.sfei.org/invasions.html	
57	SFEI	Regional Monitoring Program for Trace Substances	Obtain data on toxic trace elements and organic contaminates	http://www.sfei.org/rmp/Fact_Sheets/98factsheet.html	rainer@sfei.org
58	SFEI	Wetland Regional Monitoring Progrm	In development -- wetlands in SF Bay		Josh Collins, SFEI josh@sfei.org
59	Solano County ?	Solano County Habitat Conservation Plan (HCP)			
60	Solano County Water Agency	Section 7	mapping effort for county to lead into an HCP		David Okita, GM for the water agency
61	South Sacramento County ?	South Sacramento County Habitat Conservation Plan (HCP)			
62	The Nature Conservancy	1998/99 Weed Survey	weed reports, animal pest reports, state woe reports, state weed reports	http://tncweeds.ucdavis.edu/survey.html	bazza@ucdavis.edu
63	The Nature Conservancy	Natural Heritage Program Conservation Data Center Network	Biological inventories, aerial photos, geographic and topographic data, restoration plans	http://www.tnc.org http://www.heritage.tnc.org/	

	Agency/ Organization	Monitoring Program	Monitoring Information	Web Page	Contact
64	UC Davis	Amphibian Surveys			
65	UC Davis	Cosumnes Research Group	Coupled Hydrogeomorphic Ecosystem Model for the Cosumnes & Mokelumne Rivers	www.ice.ucdavis.edu/crg	Jeffrey Mount 530-754-9133 mount@geology.ucdavis.edu
66	UCD	Center for Ecological Health Research	Varied for different watersheds	http://ice.ucdavis.edu/cehr/	Cheryl Smith 530/752-5028 csmith@ucdavis.edu
67	UCD	Putah-Cache Bioregion Project	Riparian inventory, biomonitoring, distribution and ecology of Putah Creek fishes, Wood Ducks, CA Quail Restoration	http://wdsroot.ucdavis.edu/clients/pcbr/default.html	Peter Moyle 530-752-6355 pbmoyle@ucdavis.edu
68	UCD		Studies regarding contaminant effects on red-tailed hawks, kestrels and ospreys		
69	UCD ?	California Inland Invertebrate Work Group	Interests include FW and terrestrial insects, crustaceans, other inverts especially Threatened or Endangered	http://ice.ucdavis.edu/California_Inland_Invertebrate_Work_Group/	Richard Hill voice : (916) 653-8417 e-mail : rehill@ix.netcom.com,
70	UCD ? / Resources Agency	CA Rivers Assessment Interactive Web Database	CARA is both a database and a link to other environmental data sources, GIS	http://endeavor.des.ucdavis.edu/newcara/	Scott Clemons, Wildlife Conservation Board 916/445-1072 sclemons@hq.dfg.ca.gov
71	US Dept. of Animal and Plant Health	Dept. of Animal and Plant Health Inspection Service (APHIS)	Weed and pest monitoring	http://www.ceris.purdue.edu:80/napis/caps/index.html	Robert G. Spaide; National Survey Coordinator, (301)734-8247
72	US EPA	Environmental Monitoring and Assessment Program (EMAP)	Data on fish, macroinverts, & habitat assessment from '94 on CV Streams	http://www.epa.gov/emap/html/remap/nine/	Gary Wolinsky (415) 744-2015
73	US EPA	National Estuaries Program SF Estuary		http://www.epa.gov/owow/estuaries/sfe.htm	Marcia Brockbank (510) 622-2465 marciab@abag.ca.gov
74	USBR/DWR/Suisun RCD/DFG	Suisun Marsh Preservation Agreement - Section 7			Terri Gaines, DWR, 227-7522
75	USDA Natural Resources Conservation Service	1997 National Resources Inventory	Data on cover, soil use, prime farmland soils wetland, habitat diversity, selected conservation practices, etc	http://www.nhq.nrcs.usda.gov/CCS/NRIrlse.html **CA page**: http://www.ca.nrcs.usda.gov/nri/index.html	nri@nhq.nrcs.usda.gov.

	Agency/ Organization	Monitoring Program	Monitoring Information	Web Page	Contact
76	USDA Natural Resources Conservation Service	Ecological Site Description (ESD) and Ecological Site Inventory (ESI)	Plant characteristics, communities, site interpretations, and physiographic info for forest and rangeland	http://plants.usda.gov/esis/index.html	
77	USDA Natural Resources Conservation Service	Soil Survey Laboratory	Soil data	http://www.ca.nrcs.usda.gov/mlra/index.html	
78	USFWS	[Future] Red-legged frog monitoring			Ina Pisani, Recovery Team Manager 707/562-3004 Ina_Pisani@fws.gov
79	USFWS	Bird Banding Lab		http://www.pwrc.nbs.gov/bbl/default.htm (USGS)	
80	USFWS	Harvest Information Program (HIP)	Bird info. (hunters report birds they shoot)		
81	USFWS	International Shorebird Survey			
82	USFWS	Invasive Exotic Species Strategic Plan			
83	USFWS	July Duck Production Survey			
84	USFWS	Monitoring Avian Productivity and Survivorship			
85	USFWS	Monitoring with Checklists			
86	USFWS	Mourning Dove Call-Count Survey			
87	USFWS	Partners for Fish and Wildlife	Exotic species monitoring		
88	USFWS	Refuge Monitoring	Exotic species monitoring		
89	USFWS	Winter Surveys			
90	USFWS and Canadian Wildlife Service	May Breeding Waterfowl and Habitat Survey			
91	USFWS and State Water Resources Control Board	Phelan Island Restoration and Farming Project	Swainson's Hawk, Valley Elderberry Longhorn Beetle	http://endeavor.des.ucdavis.edu/CERPI/ProjectDescription.asp?ProjectPK=4603	Sam Lawson (530) 897-6371 slawson@tnc.org
92	USFWS Antioch Dunes National Wildlife Refuge	Antioch Dunes Evening Primrose and Contra Costa Wallflower Monitoring	Annual populations counts of both species		Ivette Loredo Ivette_Loredo@fws.gov 510-792-0222

	Agency/ Organization	Monitoring Program	Monitoring Information	Web Page	Contact
93	USFWS Antioch Dunes National Wildlife Refuge	Lange's Matalmark Butterfly Monitoring	Annual population count of flying adults in summer on refuge		Ivette Loredo Ivette_Loredo@fws.gov 510-792-0222
94	USFWS SF Bay National Wildlife Refuge Complex	California Clapper Rail Monitoring in South SF Bay Marshes	Spring and winter population censuses		Joy Albertson 510-792-0222 Joy_Albertson@fws.gov
95	USFWS SF Bay National Wildlife Refuge Complex	Western Snowy Plover Monitoring in South SF Bay (shorebird guild)	Population and reproductive success annual census		Joy Albertson 510-792-0222 Joy_Albertson@fws.gov
96	USFWS/USGS	Breeding Bird Survey			
97	USFWS/USGS/DFG	Colonial Waterbird Monitoring			
98	USGS	Hawk Migration Monitoring			
99	USGS	Marsh Bird Monitoring			
100	USGS	Migration Monitoring			
101	USGS	Night Bird Monitoring			
102	USGS	North American Amphibian Monitoring Program			
103	USGS - Patuxent Wildlife Research Center	Frogwatch USA	Long term frog and toad data	http://www.mp2-pwrc.usgs.gov/frogwatch/	Gideon Lachman, (301) 497-5819 Gideon_Lachman@usgs.gov
104	USGS-BRD	Giant Garter Snake Monitoring			Glenn Wylie - USGS John Beam - DFG in SJ Valley (coordinated with USGS)
105	Yolo County	Yolo County Habitat Conservation Plan (HCP)	Alkali Milk-vetch, Bank Swallow, California Yellow Warbler, California Yellow-billed Cucko, Crampton's Tuctoria, Giant Garter Snake, Swainson's Hawk, Valley Elderberry Longhorn Beetle	http://endeavor.des.ucdavis.edu/CERPI/ProjectDescription.asp?ProjectPK=3170	Terry Roberts, City of West Sacramento Community Development (916) 373-5854
106		Samuel's Song Sparrow in San Pablo Bay Marshes			Nadav Nur 415-868-1221