

OVERVIEW OF CALFED BAY-DELTA PROGRAM ASSESSMENT STRATEGY

INTRODUCTION

This paper presents information on an assessment strategy being developed for CALFED Bay-Delta Program (CALFED) assessment purposes. Attached to this overview of the strategy are:

- a preliminary list of the assessment variables that will be used to evaluate the various alternative components and actions and to compare the impacts and benefits of the multiple variations in CALFED programmatic alternatives and their components (Table 1),
- charts showing the chains of relationships that govern the responses of some of the key assessment variables to potential CALFED actions, and
- descriptions of the charts of variables and several of the important relationships in the enclosed chains of relationships that are based on existing models or historical data.

PROPOSED ASSESSMENT STRATEGY

An assessment variable represents an important change to environmental conditions possibly caused by CALFED actions that can be judged to be beneficial or detrimental relative to human values and uses. The value of each assessment variable is determined by a "chain of relationships" connecting a CALFED action (e.g., increasing river flows during the critical period for smolt outmigration) through a series of relationships to the assessment variable deemed important and being evaluated (e.g., chinook salmon outmigration success). To conduct the assessment, each relationship in the chain must be evaluated using analytical tools that may include simulation models, analyses of historical data, calculated indices, or expert opinions.

The development of this assessment strategy has been guided by three key programmatic assessment needs (Figure 1) to:

- understand the effects of the CALFED action components and linkages between those components;

- provide information for comparative assessments of the CALFED programmatic alternatives; and
- avoid unnecessary detail and complexity and, therefore, allow meaningful programmatic assessments to be completed within CALFED Phase II.

LIST OF ASSESSMENT VARIABLES. The proposed assessment variables are selected to represent important changes to environmental conditions possibly caused by CALFED actions. They are organized by resource topic in Table 1 within the categories of “Physical Environment”, “Biological Environment”, and “Socioeconomic Environment”. The following criteria were used to identify these assessment variables (Figure 1):

- They will be altered or modified substantially by one or more of the potential CALFED actions (i.e., they are sensitive and responsive to possible changes).
- They represent changes to the environment that can be judged to be beneficial or detrimental relative to human uses and values.
- They are useful in summarizing and distinguishing impacts and benefits of alternatives and actions defined at the programmatic level of detail.
- They are useful for assessing impacts and benefits at an appropriate spatial scale and temporal resolution for CALFED programmatic alternatives.

In this preliminary list of assessment variables, staff has attempted to identify the minimum number of variables needed to appropriately represent the possible benefits and impacts of the CALFED programmatic alternatives. Additions to the list may be needed to reflect other environmental uses and values important to humans. Some variables may be removed from the list if they are more appropriately regarded as secondary factors or controlling variables for other assessment variables.

The assessment variables presented in Table 1 are to be used to evaluate the various alternative components and actions and for evaluating direct impacts and benefits of CALFED programmatic alternatives. They may not include variables that may be needed to assess cumulative impacts of the alternatives relative to the No-Action Alternative under future conditions.

CHAINS OF RELATIONSHIPS. “Chains of Relationships” connect a CALFED action, through a series of relationships, to the assessment variable being evaluated. A “control variable” is the variable that is directly changed by a CALFED action or component (e.g., flow management would directly change river flows); additional links or variables in the chains of relationships are supporting variables (e.g., river flows would affect water temperature, which could change the area of quality habitat for spawning success). The beneficial or detrimental change to an assessment variable is determined by the relationships between variables, including several control variables, in the chain. (Figure 2). To conduct the impact assessment, each relationship between variables in the chain must be evaluated using analytical tools that may include simulation models, analyses of historical data,

calculated indices, or expert opinions. For example, existing simulation models can be used to perform sensitivity analyses of varying inputs and outputs (e.g., Delta inflows and exports); regression results can be developed from historical data to show relationships between variables of interest (e.g., Delta outflow and salinity levels); expert opinion can be used to describe likely effects of CALFED actions on assessment variables.

Chains of relationships may vary widely in complexity among the assessment variables listed in Table 1. Some are straightforward with few relationships between controlling variables and easily assessed using relatively simple analytical tools (e.g., assessment of land use changes using a GIS overlay of facility corridors on land use data layers). Others contain many interacting, and often poorly understood, relationships (e.g., effects of Delta inflows on resident fish spawning success). In general, staff has attempted to identify the most simple and straightforward set of relationships between possible CALFED actions and each assessment variable.

Attached to this overview are packages of information on selected chains of relationships for several key assessment variables. Each package consists of:

- an overview describing the chain of relationships for the selected assessment variable,
- a chart showing the controlling variables in the chain of relationships between possible CALFED actions and the assessment variable, and
- descriptions of several of the candidate key relationships in each chain with suggested analytical tools or data that could be used to quantify the relationships.

INTENDED BENEFITS OF ASSESSMENT STRATEGY. The assessment strategy represented by these chains of relationships is intended to provide the following benefits to the CALFED programmatic impact analysis:

- The chains of relationships can explicitly document the assumed connections between possible CALFED actions, important assessment variables, and the types of analytical tools (e.g., model runs or historical data) that could be used to evaluate the relationships. This provides full disclosure of the Phase II assessment strategy.
- The chains of relationships can be easily modified and applied to multiple variations in CALFED components and actions. This provides maximum flexibility during the Phase II assessment.
- The chains of relationships can be built and evaluated using widely different types of analytical tools and available information. This allows full participation of all stakeholders and equal consideration of all important issue areas during Phase II assessment.

TABLE 1

PROPOSED ASSESSMENT VARIABLES

I. PHYSICAL ENVIRONMENT

- A. Surface-Water Hydrology
 - 1. Runoff from Watersheds
 - 2. Evapotranspiration from Program Features
- B. Water Management Facilities and Operations
 - 1. Reservoir storage volumes, releases, and spills
 - 2. Instream flow targets, deficits, and surpluses
 - 3. Diversions/exports targets, deficits, and surpluses
 - 4. Agricultural drainage volumes
 - 5. Remaining opportunities for storage, diversion, and instream flow
- C. Groundwater Hydrology
 - 1. Groundwater supply yield
 - 2. Groundwater elevation (storage) volume
- D. Riverine Hydraulics
 - 1. Hydraulic geometry relative to natural erosion/deposition processes
- E. Bay-Delta Hydrodynamics
 - 1. Delta outflow
 - 2. X2 location
 - 3. QWEST flow
 - 4. Water entrainment in diversions/exports

- F. Water Quality
 1. EC in agricultural irrigation water
 2. Chloride and bromide levels in export water
 3. Dissolved organic carbon levels in export water
 4. Disinfection byproduct concentrations in treated drinking water
 5. Dissolved oxygen concentration in San Joaquin River at Stockton
 6. Selenium levels in San Joaquin River inflow
 7. Heavy metal and pesticide residue concentrations

- G. Geomorphology and Soils
 1. Soil erosion from agricultural operations
 2. Bank erosion from channel migration
 3. Soil salinity
 4. Subsidence caused by peat oxidation
 5. Subsidence caused by groundwater withdrawals

- H. Air Quality
 1. Dust and smoke from agricultural operations
 2. Power plant emissions caused by changes in hydropower generation or pumping
 3. Emissions produced by construction and operation of facilities

II. BIOLOGICAL ENVIRONMENT

- A. Riverine Aquatic Habitat
 1. Area of suitable spawning substrates
 2. Area of suitable rearing and migration habitat
 3. Area of floodplain subject to natural erosion/deposition processes

4. Area of floodplain subject to periodic wet-year inundation
5. Flow through unscreened diversions
6. Connectivity and juxtaposition of restored habitats

B. Estuarine Aquatic Habitat

1. Area of shallow tidal habitat (depth ranges: <1m, 1-2 m, >2 m)
2. Area of shallow/shaded riverine habitat
3. Length of shaded riverine aquatic habitat
4. Area of channel subject to natural erosion/deposition processes
5. Flow through unscreened diversions
6. Connectivity and juxtaposition of restored habitats
7. Primary productivity in key rearing habitats

C. Fishery Resources

1. Winter-run chinook salmon
 - adult migration success
 - spawning success
 - rearing success
 - outmigration success
 - ocean survival
2. Spring-run chinook salmon
 - as above
3. Late fall-run chinook salmon
 - as above
4. Sacramento fall-run chinook salmon
 - as above
5. San Joaquin fall-run chinook salmon
 - as above
6. Steelhead trout
 - as above

7. American shad
 - in progress
8. Green sturgeon
 - in progress
9. White sturgeon
 - in progress
10. Striped bass
 - spawning success
 - freshwater survival
 - ocean survival
11. Splittail
 - adult and juvenile survival
 - spawning success
12. Delta smelt
 - as above
13. Longfin smelt
 - in progress

D. Wetland and Terrestrial Habitat

1. Area of freshwater marsh habitat
2. Area of riparian woodland habitat
3. Area of agricultural lands providing wildlife habitat values

E. Plants and Wildlife
(species or groups to be identified)

III. SOCIOECONOMIC ENVIRONMENT

A. Land Use

1. Acres in agricultural uses
2. Acres in open space and habitat uses
3. Acres in developed uses

- B. Agricultural Economics
 - 1. Agricultural net income
 - 2. Value of production

- C. Municipal and Industrial Water Supply Economics
 - 1. Cost of water supply
 - 2. Cost of shortage
 - 3. Cost of treatment

- D. Flood Control System and Other Infrastructure
 - 1. Value of flood damage protection
 - 2. Cost of repair after failure
 - 3. Probability of levee failure
 - 4. Cost of flood-damage protection

- E. Power Production
 - 1. Quantity and value of energy produced
 - 2. Quantity and cost of energy consumed

- F. Recreation (boating, fishing, hunting, etc.) and Visual Resources
 - 1. Recreation user days
 - 2. Recreation economics

- G. Commercial Fishing
 - 1. Amount harvested
 - 2. Value of harvest
 - 3. Fishing related employment and income

H. Regional Economics

1. Income

2. Employment

3. Fiscal conditions

I. Cultural Resources

1. Risk to archeological (e.g., burial grounds) sites

2. Risk to historic sites

**Figure 1. Analytical Level-of-Detail
Guidance for Programmatic Assessment Strategy
and Analytical Tools**

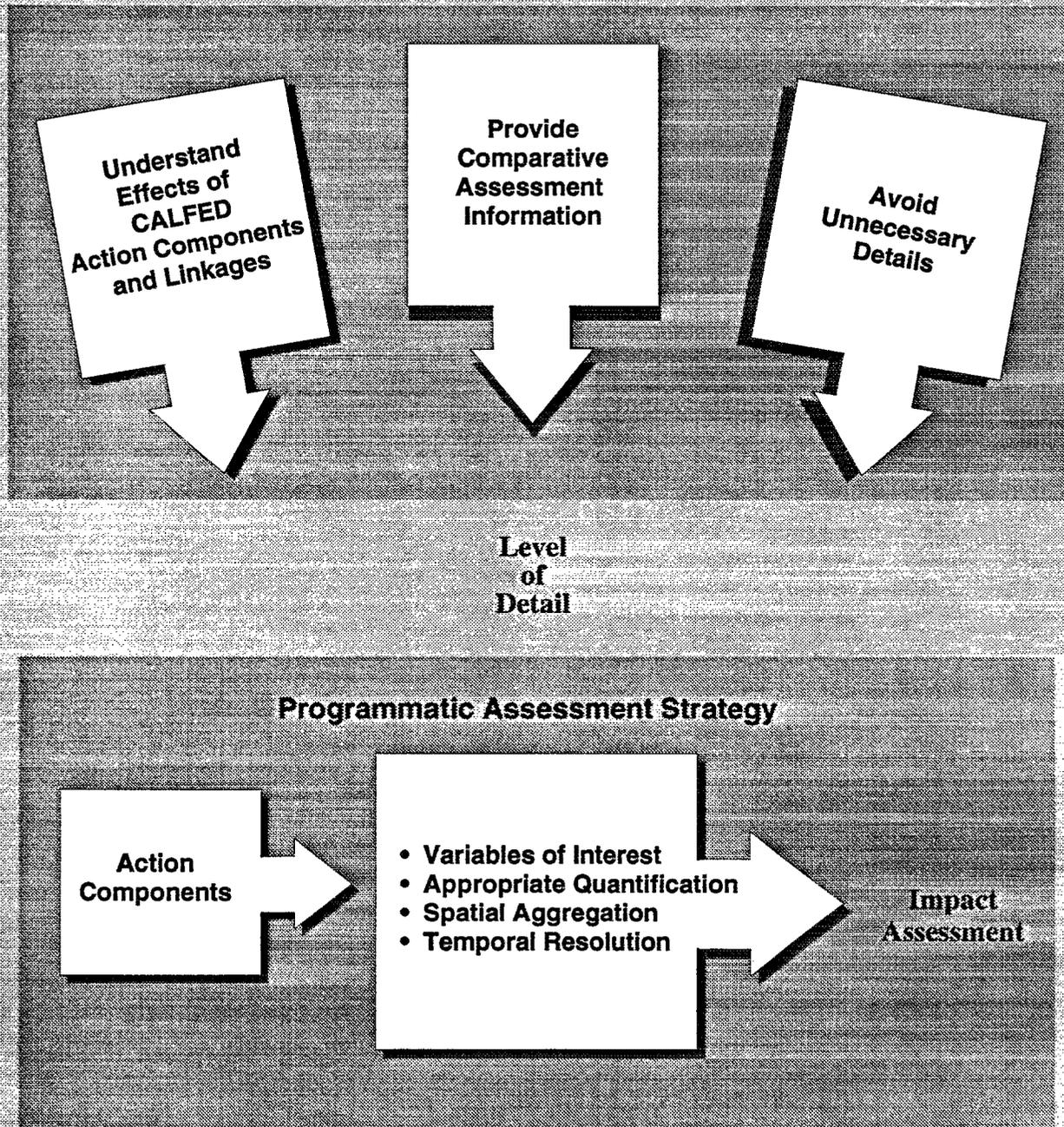
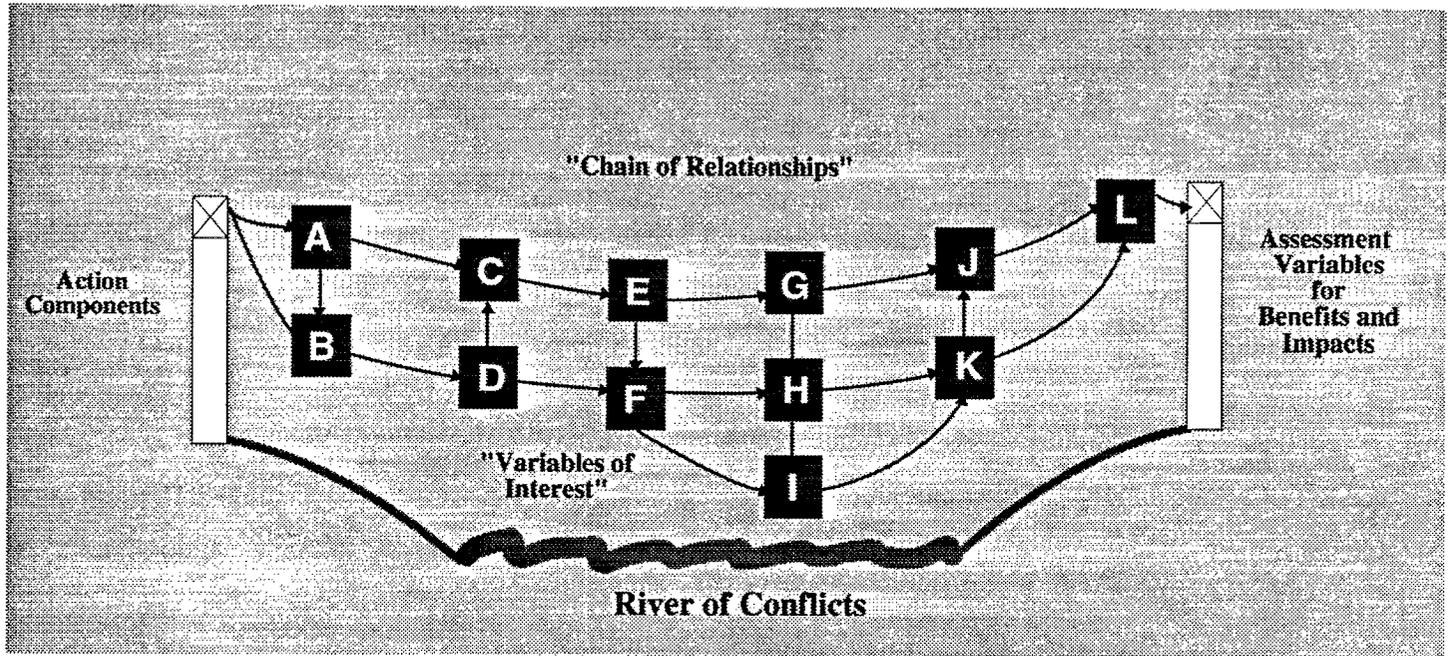


Figure 2. CALFED Programmatic Assessment Strategy



Analytical Tools: Variables and Relationships

