

**CALFED**

**TECHNICAL REPORT  
ENVIRONMENTAL CONSEQUENCES**

**RECREATION RESOURCES**

**Including Recreation Land Use; Recreational Opportunities; Fish, Wildlife & Recreation  
Economics; and Social Well Being Related to Recreation**

**DRAFT**

**March 1998**



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## LIST OF ACRONYMS

|        |  |
|--------|--|
| CALFED | CALFED Bay-Delta Program                           |
| cfs    | cubic foot per second                              |
| CVP    | Central Valley Project                             |
| CVPIA  | Central Valley Project Improvement Act             |
| MWD    | Metropolitan Water District of Southern California |
| NWR    | National Wildlife Refuge                           |
| RVD    | recreation visitor-day                             |
| SWP    | State Water Project                                |
| TAF    | thousand acre-feet                                 |

# RECREATION RESOURCES

## **INTRODUCTION**

This technical report discusses impacts on recreation resources associated with implementing the CALFED Bay-Delta Program (CALFED). Recreation resources include recreation land use; recreational opportunities; fish, wildlife, and recreation economics; and social well being related to recreational resources.

- Habitat and ecosystem restoration actions that result in increased opportunities for passive recreation, and
- Improved conditions for fish and wildlife that result in increased numbers of game and non-game species.

Many key variables were considered, such as changes in flows, river temperature, and the quality of recreation experience, as discussed at length under "Significance Criteria" below.

## **Recreation Land Use**

CALFED activities that could result in potentially significant impacts on recreation land use include changes in physical land uses or land use designations from construction of new facilities and converting lands from one use to another.

## **Recreational Opportunities**

The assessment of impacts on recreational opportunities addresses changes in recreational opportunities and recreation use.

Examples of CALFED actions that could affect recreational opportunities include:

- Temporary or permanent closure or relocation of recreation facilities,
- Improvements in the quality of recreation, such as improved water quality for water contact recreation activities,

## **Fish, Wildlife & Recreation Economics**

This assessment of impacts on fish, wildlife, and recreation economics identifies the direction and magnitude of changes in recreation spending and recreation benefits for:

- Sport fishing for anadromous species in coastal waters, bays, estuaries, and rivers;
- Water-based recreation activities at rivers;
- Water-based activities at reservoirs; and
- Wildlife-related recreation activities.

CALFED actions that could affect fish, wildlife, and recreation economics are similar to those described above for recreation land use and recreation. In general, increased opportunities for recreation and improvements in the quality of the recreation would result in increased spending for recreation-related activities.

## ***Social Well Being Related to Recreation***

The assessment of social well being addresses community stability and environmental justice. The assessment of community stability evaluates the ability of people and communities to cope with changes in economic and demographics that may occur as a result of a CALFED action. Environmental justice evaluates whether one racial or economic group would experience "disproportionately high and adverse human health or environmental effects" from a CALFED action. The focus of the social well being discussion in this report is recreationists and recreation workers.

However, much of the data needed to infer the effects on employment and other measures of social well being are not available at the programmatic level. Therefore, this issue is treated qualitatively.

### **ASSESSMENT METHODS**

Programmatic impacts on recreation resources include both short-term construction-related impacts and long-term operational impacts. These may be either direct or indirect.

Direct impacts are those that have an immediate cause and effect relationship to a program action. Indirect effects typically occur later in time or are further removed in distance from the program action.

#### ***Recreation Land Use***

This program-level assessment does not provide site-specific details or specific estimates of acreages potentially affected for a given alternative. Rather, potential increases or decreases in the area of a given land use by region were qualitatively estimated or described with a range of gross acres.

## ***Recreational Opportunities***

Both qualitative and quantitative methods were used to assess the changes in recreational opportunities. Where recreational opportunity thresholds (for example, the reservoir level at which boat ramps become unusable or stream flows where rafting becomes infeasible) and necessary input data existed, they were used to assess the effects of CALFED actions on recreational opportunities. For this programmatic analysis, primarily qualitative methods were used, based on historical use data; availability and accessibility of recreation sites; and the abundance of fish, waterfowl, and support facilities (for example, boat launches and marinas).

### ***Fish, Wildlife & Recreation Economics***

Each CALFED program element could affect economic values associated with the use of fish, wildlife, and recreation resources. The analysis focused on measuring changes in recreation spending and net benefits to recreation users relative to No Action Alternative levels.

The analysis is based on estimating the net economic benefits (or costs) associated with CALFED program actions. The net benefit (or costs) may theoretically be derived from subtracting the costs of recreation from the benefits of recreation. Recreation costs include the cost of providing additional recreational opportunities relative to baseline levels (both existing conditions and No Action Alternative conditions) and the costs associated with any loss in recreational opportunities that may result from program actions. In many cases, economic values associated with both the costs and the benefits of recreational opportunities are either unknown, are only partially known, or are intangible and cannot be assigned a dollar value.

Due to the inherent difficulties in assigning economic values to all recreational costs and benefits, the analysis of economic impacts of the CALFED Program on recreational resources was assessed qualitatively, based on selected indicators of the economic costs and benefits.

The assessment was conducted in five steps:

1. The values for the No Action Alternative were estimated by adjusting the levels for existing conditions to reflect the percentage change in population from 1995 to 2020 and to account for expected changes resulting from projects included in the No Action Alternative. Recreation-related spending in each region includes estimated spending by residents of, and visitors to, the region.
2. Relevant changes in physical resources were identified by alternative and region based on discussions with resource specialists for fisheries, vegetation and wildlife, and recreation resources topics and review of their respective environmental consequences draft technical reports.

The evaluation of impacts on fishery resources primarily considered potential impacts of CALFED alternatives on populations of anadromous species. The relative changes in fish abundance were determined to be uniform across all affected regions. The results of the impact assessment provided by the fishery specialists are presented in Table S-1 of the Supplement.

The analysis of impacts on wildlife resources focused on potential impacts of CALFED alternatives on the abundance of birds important to wildlife viewing and hunting. The analysis considered waterfowl, upland game birds, and riparian birds. Because impacts primarily were related to the Ecosystem Restoration Program, which is part of all alternatives, impacts were not differentiated by

alternative. The results of the impact assessment provided by the wildlife specialists are presented in Table S-2 of the Supplement.

The impact analysis for recreation resources focused on hydrology-related effects, including changes in river flows, reservoir storage, and water quality. Construction impacts on recreational opportunities also were considered. The results of this assessment are presented in Table S-3 of the Supplement.

The overall effect of impacts on these physical resources (fisheries, wildlife, and recreation) were judged to be small, moderate, or large.

3. The effect of physical changes on relevant economic activities in each region were identified. These activities included sport fishing for anadromous fish, river recreation activities other than sport fishing, reservoir recreation activities, and wildlife-related recreation activities. The results of this assessment are presented in Table S-4 of the Supplement.
4. The overall regional effect then was determined by considering the aggregate effect of all affected activities within each region. The relative importance of an activity in a region (Table S-5) was considered in weighting the effects of different activities. The results of this assessment are presented in Table S-6 of the Supplement.
5. The values for the economic variables in the No Action Alternative then were adjusted to reflect the predicted magnitude of change in the relevant economic variables. A small change was assigned a 1 to 4% increase (or decrease) relative to the No Action Alternative level, a moderate change was assigned a 5 to 9% increase; and a large change was assigned a 10 to 20% increase. (The only negative change relative to the No

Action Alternative level was associated with Configuration 1A in the SWP and CVP Service Areas Outside the Central Valley.) The results of this assessment are presented in Tables 1 through 6 of this report.

The impact assessment focused on estimating positive effects of CALFED alternatives without explicit consideration of any adverse effects resulting from increased fees or taxes on environmental resources users. Potentially, users of the affected environmental resources may be expected to pay for some CALFED costs through higher fishing license or permit fees; higher user fees at reservoirs, rivers, and wildlife areas; or through increases in excise taxes on equipment used for outdoor recreation purposes.

Estimates are not available on the magnitude of CALFED costs, and policies have not been developed for allocating costs to users of environmental resources. It should be recognized, however, that increasing fees or taxes on users of environmental resources would lessen the positive impact on the economic variables described in this report; consequently, the positive impacts described may be overstated, the magnitude of which largely depends on how much of the overall CALFED costs are ultimately borne by environmental resource users.

### ***Social Well Being Related to Recreation***

The evaluation for the social analysis was based on the regional economics analysis and projected changes to regional employment. These findings were applied to the analysis for the identified social groups.

## **SIGNIFICANCE CRITERIA**

### ***Recreation Land Use***

Impacts on recreation land use were considered potentially significant if implementing a CALFED action would result in:

- Land use impacts on refuges,
- Inconsistency with land use objectives of local and regional plans, or
- Changes in the amount or quality of open space, open water, and habitat land uses.

The compatibility and consistency of potential CALFED actions with local and regional plans were not evaluated for this program-level document. For this analysis, all land use changes were assumed potentially inconsistent with local and regional plans, and therefore potentially significant. A potentially significant beneficial impact could be associated with a change in land use, however, depending on the amount and quality of the existing land use and the amount and quality of the converted use for recreation uses. These data were unavailable for this program-level assessment. All changes in land use were noted as potentially significant impacts.

### ***Recreational Opportunities***

Changes in recreational opportunities and recreation use were evaluated to assess the impacts of CALFED alternatives on recreation resources.

Both water-based and land-based recreational opportunities may be affected by CALFED Program actions. Changes in land use or water resource conditions may have direct impacts on recreational opportunities. In addition, Program activities that affect fish and wildlife or aquatic

resources may indirectly impact recreational opportunities. The effects of program actions on these resources are discussed in the Technical Reports in each of the individual resource topics (see additional supporting documents.). However, the significance of these effects on recreational opportunities are described here.

Several different criteria were used to determine whether each of the proposed alternatives could result in a potentially significant impact on existing recreation activities in the project area at the programmatic level. The significance criteria used for a qualitative evaluation are substantially broader than those used for a quantitative or project-level analysis.

Program actions would have a significant adverse impact on recreational opportunities if they resulted in a substantial reduction in the recreational use of a resource or facility. Although professional judgment must be relied upon in evaluating the significance of an impact on recreational opportunities, a conservative approach has been used, in which any reduction in recreational opportunity associated with program actions is considered potentially significant unless otherwise noted.

Conversely, if the program actions could increase the potential recreational opportunities associated with a resource or facility, the impacts are considered beneficial.

For this analysis, an impact was considered potentially significant if implementing a CALFED action would result in:

- Potential for fluctuation in lake or reservoir water levels that could result in:
  - Changes in recreational opportunities,
  - Potential for significant propeller damage to boats from exposed hazards as water level drops,
  - Exacerbation of conflicts between recreational user groups,
- Potential to expose boat launches and limiting or prohibiting the use of boat facilities, or
- Reduction in recreation visitor-days (RVDs).
- Changes in freshwater flows in rivers and the Delta during the recreational season.
- Changes in recreational opportunities due to reduced average flows in rivers used by boaters, including rafters and kayakers.
- Changes in river temperature that reduce recreational swimming, tubing, canoeing, kayaking, and rafting.
- Changes in the quality of the recreational boating experience in Delta channels, including changes in boating circulation and cruising patterns.
- Temporary closing of channels and rerouting during construction.
- Temporary restriction of recreation activities during construction.
- Conversion of recreation facilities to other uses.
- Changes in aesthetic conditions that could affect visitor appreciation of an area;
- Reduction of opportunities for one activity resulting in an increase in RVDs for other recreational uses in the Delta (shifting activities).
- Changes in nature walk or sightseeing activities associated with fishery changes.
- Changes in fishing or hunting opportunities.
- Changes in accessibility to recreational sites.
- Change in regulations related to boating.

## ***Fish, Wildlife & Recreation Economics***

An impact on fish, wildlife, and recreation economics was considered potentially significant if implementing a CALFED action would result in:

- Change of 10% or more in recreation spending or recreation benefits.

Ten percent was considered a reasonable threshold by which to differentiate impacts of CALFED actions from those associated with year-to-year fluctuations in economic conditions and to identify effects that are beyond the expected margin of error inherent in the estimation methods.

The results of this economic impact analysis were used in other impact assessments to determine the significance of changes in the physical environment caused by CALFED. The results of this analysis were considered when evaluating fishery resources, wildlife resources, recreation, and hydrology.

## ***Social Well Being Related to Recreation***

Community stability is measured by several economic indicators as well as by community structure. Economic indicators include per capita and per household income, unemployment, poverty rates, and employment opportunities. Adverse impacts on stability could result from changes to any of these indicators. Community structure is reflective of the community's ability to adapt to changes such as an increase in unemployment or a shift in employment opportunities. Measures of community structure include the availability of

job training resources or educational opportunities.

For this analysis, loss of jobs for recreation workers was considered a potentially significant impact.

Environmental justice impacts were considered potentially significant if implementing a CALFED action would result in the disproportionate distribution of environmental or health impacts to people of a particular minority racial background or low-income group.

## ***ENVIRONMENTAL CONSEQUENCES***

### ***Comparison of No Action Alternative to Existing Conditions***

Tables 1 through 6 provide summaries of impacts on recreation resources by region.

The key changes between existing conditions and the No Action Alternative that would affect recreation land use involve converting land uses to accommodate storage and conveyance facilities associated with projects anticipated in the No Action Alternative. These actions are not anticipated to significantly affect recreation land uses.

The following sections describe fish, wildlife, and recreation economic conditions for each region under the No Action Alternative. Economic conditions are characterized by expected 2020 levels of recreation-related expenditures and benefits. Projected levels of these economic indicators reflect 1995 levels, adjusted by population growth factors and the probable effects of actions considered as part of the No Action Alternative.

|                       | Sport Fishing for Anadromous Fish |                   | Other Water-Based Recreation Activities for Rivers |                     | Water-Based Activities At Reservoirs |              | Wildlife-Based Recreation Activities |                | Total    |              |
|-----------------------|-----------------------------------|-------------------|--|---------------------|--------------------------------------|--------------|--------------------------------------|----------------|----------|--------------|
|                       | Spending                          | Net Benefits      | Spending   | Net Benefits        | Spending                             | Net Benefits | Spending                             | Net Benefits   | Spending | Net Benefits |
|                       |                                   |                   |  |                     |                                      |              |                                      |                |          |              |
| Existing Conditions   | 119                               | 39                | 102  | 117                 | NA                                   | NA           | 5                                    | 3              | 226      | 159          |
| No Action Alternative | 220                               | 70                | 170  | 195                 |                                      |              | 10                                   | 5              | 400      | 270          |
| Configuration 1A      | Pos, Mod<br>231-240               | Pos, Mod<br>74-76 | Pos, Sm<br>172-178                                 | Pos, Sm<br>197-203  |                                      |              | Pos, Lg<br>11-12                     | Pos, Lg<br>6-7 | 414-430  | 277-286      |
| Configuration 1B      | Pos, Mod<br>231-240               | Pos, Mod<br>74-76 | Pos, Mod<br>178-186                                | Pos, Mod<br>204-214 |                                      |              | Pos, Lg<br>11-12                     | Pos, Lg<br>6-7 | 420-436  | 284-297      |
| Configuration 1C      | Pos, Mod<br>231-240               | Pos, Mod<br>74-76 | Pos, Mod<br>178-186                                | Pos, Mod<br>204-214 |                                      |              | Pos, Lg<br>11-12                     | Pos, Lg<br>6-7 | 420-436  | 284-297      |
| Configuration 2A      | Pos, Sm<br>222-230                | Pos, Sm<br>71-73  | Pos, Mod<br>178-186                                | Pos, Mod<br>204-214 |                                      |              | Pos, Lg<br>11-12                     | Pos, Lg<br>6-7 | 411-428  | 281-294      |
| Configuration 2B      | Pos, Sm<br>222-230                | Pos, Sm<br>71-73  | Pos, Mod<br>178-186                                | Pos, Mod<br>204-214 |                                      |              | Pos, Lg<br>11-12                     | Pos, Lg<br>6-7 | 411-428  | 281-294      |
| Configuration 2D      | Pos, Mod<br>231-240               | Pos, Mod<br>74-76 | Pos, Mod<br>178-186                                | Pos, Mod<br>204-214 |                                      |              | Pos, Lg<br>11-12                     | Pos, Lg<br>6-7 | 420-436  | 284-297      |
| Configuration 2E      | Pos, Mod<br>231-240               | Pos, Mod<br>74-76 | Pos, Lg<br>187-204                                 | Pos, Lg<br>215-235  |                                      |              | Pos, Lg<br>11-12                     | Pos, Lg<br>6-7 | 429-456  | 295-318      |
| Configuration 3A      | Pos, Lg<br>241-264                | Pos, Lg<br>77-84  | Pos, Lg<br>187-204                                 | Pos, Lg<br>215-235  |                                      |              | Pos, Lg<br>11-12                     | Pos, Lg<br>6-7 | 439-480  | 298-326      |
| Configuration 3B      | Pos, Lg<br>241-264                | Pos, Lg<br>77-84  | Pos, Lg<br>187-204                                 | Pos, Lg<br>215-235  |                                      |              | Pos, Lg<br>11-12                     | Pos, Lg<br>6-7 | 439-480  | 298-326      |
| Configuration 3E      | Pos, Lg<br>241-264                | Pos, Lg<br>77-84  | Pos, Lg<br>187-204                                 | Pos, Lg<br>215-235  |                                      |              | Pos, Lg<br>11-12                     | Pos, Lg<br>6-7 | 439-480  | 298-326      |
| Configuration 3H      | Pos, Lg<br>241-264                | Pos, Lg<br>77-84  | Pos, Lg<br>187-204                                 | Pos, Lg<br>215-235  |                                      |              | Pos, Lg<br>11-12                     | Pos, Lg<br>6-7 | 439-480  | 298-326      |
| Configuration 3I      | Pos, Lg<br>241-264                | Pos, Lg<br>77-84  | Pos, Lg<br>187-204                                 | Pos, Lg<br>215-235  |                                      |              | Pos, Lg<br>11-12                     | Pos, Lg<br>6-7 | 439-480  | 298-326      |

**Table 1. Summary of Fish, Wildlife, and Recreation Economic Effects in the Delta Region (in Millions of Dollars)**

|                       | Sport Fishing for Anadromous Fish |                   | Other Water-Based Recreation Activities for Rivers |              | Water-Based Activities At Reservoirs |              | Wildlife-Based Recreation Activities |              | Total    |              |
|-----------------------|-----------------------------------|-------------------|--|--------------|--------------------------------------|--------------|--------------------------------------|--------------|----------|--------------|
|                       | Spending                          | Net Benefits      | Spending   | Net Benefits | Spending                             | Net Benefits | Spending                             | Net Benefits | Spending | Net Benefits |
| Existing Conditions   | 9                                 | 8                 | NA   | NA           | NA                                   | NA           | NA                                   | NA           | 9        | 8            |
| No Action Alternative | 23                                | 28                |  |              |                                      |              |                                      |              | 23       | 28           |
| Configuration 1A      | Pos, Mod<br>24-25                 | Pos, Mod<br>30-33 |  |              |                                      |              |                                      |              | 24-25    | 30-33        |
| Configuration 1B      | Pos, Mod<br>24-25                 | Pos, Mod<br>30-33 |  |              |                                      |              |                                      |              | 24-25    | 30-33        |
| Configuration 1C      | Pos, Mod<br>24-25                 | Pos, Mod<br>30-33 |  |              |                                      |              |                                      |              | 24-25    | 30-33        |
| Configuration 2A      | Pos, Sm<br>23-24                  | Pos, Sm<br>28-29  |  |              |                                      |              |                                      |              | 23-24    | 28-29        |
| Configuration 2B      | Pos, Sm<br>23-24                  | Pos, Sm<br>28-29  |  |              |                                      |              |                                      |              | 23-24    | 28-29        |
| Configuration 2D      | Pos, Mod<br>24-25                 | Pos, Mod<br>30-33 |  |              |                                      |              |                                      |              | 24-25    | 30-33        |
| Configuration 2E      | Pos, Mod<br>24-25                 | Pos, Mod<br>30-33 |  |              |                                      |              |                                      |              | 24-25    | 30-33        |
| Configuration 3A      | Pos, Lg<br>25-28                  | Pos, Lg<br>33-36  |  |              |                                      |              |                                      |              | 25-28    | 33-36        |
| Configuration 3B      | Pos, Lg<br>25-28                  | Pos, Lg<br>33-36  |  |              |                                      |              |                                      |              | 25-28    | 33-36        |
| Configuration 3E      | Pos, Lg<br>25-28                  | Pos, Lg<br>33-36  |  |              |                                      |              |                                      |              | 25-28    | 33-36        |
| Configuration 3H      | Pos, Lg<br>25-28                  | Pos, Lg<br>33-36  |  |              |                                      |              |                                      |              | 25-28    | 33-36        |
| Configuration 3I      | Pos, Lg<br>25-28                  | Pos, Lg<br>33-36  |  |              |                                      |              |                                      |              | 25-28    | 33-36        |

Table 2. Summary of Fish, Wildlife, and Recreation Economic Effects In the Bay Region (in Millions of Dollars)

|                       | Sport Fishing for Anadromous Fish |                   | Other Water-Based Recreation Activities for Rivers |                  | Water-Based Activities At Reservoirs |                   | Wildlife-Based Recreation Activities |                 | Total    |              |
|-----------------------|-----------------------------------|-------------------|--|------------------|--------------------------------------|-------------------|--------------------------------------|-----------------|----------|--------------|
|                       | Spending                          | Net Benefits      | Spending   | Net Benefits     | Spending                             | Net Benefits      | Spending                             | Net Benefits    | Spending | Net Benefits |
| Existing Conditions   | 12                                | 5                 | 10   | 5                | 62                                   | 34                | 2                                    | 2               | 86       | 46           |
| No Action Alternative | 22                                | 10                | 17   | 9                | 103                                  | 56                | 4                                    | 4               | 146      | 79           |
| Configuration 1A      | Pos. Mod<br>24-25                 | Pos. Mod<br>10-11 | Pos. Sm<br>17-18                                   | Pos. Sm<br>9-10  | Pos. Mod<br>108-113                  | Pos. Mod<br>58-61 | Pos. Mod<br>4-5                      | Pos. Mod<br>4-5 | 153-161  | 81-87        |
| Configuration 1B      | Pos. Mod<br>24-25                 | Pos. Mod<br>10-11 | Pos. Sm<br>17-18                                   | Pos. Sm<br>9-10  | Pos. Mod<br>108-113                  | Pos. Mod<br>58-61 | Pos. Mod<br>4-5                      | Pos. Mod<br>4-5 | 153-161  | 81-87        |
| Configuration 1C      | Pos. Mod<br>24-25                 | Pos. Mod<br>10-11 | Pos. Mod<br>18-19                                  | Pos. Mod<br>9-10 | Pos. Lg<br>114-125                   | Pos. Lg<br>62-68  | Pos. Mod<br>4-5                      | Pos. Mod<br>4-5 | 160-164  | 85-94        |
| Configuration 2A      | Pos. Sm<br>23-24                  | Pos. Sm<br>10M    | Pos. Sm<br>17-18                                   | Pos. Sm<br>9-10  | Pos. Mod<br>108-113                  | Pos. Mod<br>58-61 | Pos. Mod<br>4-5                      | Pos. Mod<br>4-5 | 152-160  | 81-86        |
| Configuration 2B      | Pos. Sm<br>23-24                  | Pos. Sm<br>10M    | Pos. Mod<br>18-19                                  | Pos. Mod<br>9-10 | Pos. Lg<br>114-125                   | Pos. Lg<br>62-68  | Pos. Mod<br>4-5                      | Pos. Mod<br>4-5 | 159-163  | 85-93        |
| Configuration 2D      | Pos. Mod<br>24-25                 | Pos. Mod<br>10-11 | Pos. Sm<br>17-18                                   | Pos. Sm<br>9-10  | Pos. Mod<br>108-113                  | Pos. Mod<br>58-61 | Pos. Mod<br>4-5                      | Pos. Mod<br>4-5 | 153-161  | 81-86        |
| Configuration 2E      | Pos. Mod<br>24-25                 | Pos. Mod<br>10-11 | Pos. Mod<br>18-19                                  | Pos. Mod<br>9-10 | Pos. Lg<br>114-125                   | Pos. Lg<br>62-68  | Pos. Mod<br>4-5                      | Pos. Mod<br>4-5 | 160-164  | 85-93        |
| Configuration 3A      | Pos. Lg<br>25-27                  | Pos. Lg<br>11-12  | Pos. Sm<br>17-18                                   | Pos. Sm<br>9-10  | Pos. Mod<br>108-113                  | Pos. Mod<br>58-61 | Pos. Mod<br>4-5                      | Pos. Mod<br>4-5 | 154-163  | 82-88        |
| Configuration 3B      | Pos. Lg<br>25-27                  | Pos. Lg<br>11-12  | Pos. Mod<br>18-19                                  | Pos. Mod<br>9-10 | Pos. Lg<br>114-125                   | Pos. Lg<br>62-68  | Pos. Mod<br>4-5                      | Pos. Mod<br>4-5 | 161-176  | 86-95        |
| Configuration 3E      | Pos. Lg<br>25-27                  | Pos. Lg<br>11-12  | Pos. Mod<br>18-19                                  | Pos. Mod<br>9-10 | Pos. Lg<br>114-125                   | Pos. Lg<br>62-68  | Pos. Mod<br>4-5                      | Pos. Mod<br>4-5 | 161-176  | 86-95        |
| Configuration 3H      | Pos. Lg<br>25-27                  | Pos. Lg<br>11-12  | Pos. Mod<br>18-19                                  | Pos. Mod<br>9-10 | Pos. Lg<br>114-125                   | Pos. Lg<br>62-68  | Pos. Mod<br>4-5                      | Pos. Mod<br>4-5 | 161-176  | 86-95        |
| Configuration 3I      | Pos. Lg<br>25-27                  | Pos. Lg<br>11-12  | Pos. Mod<br>18-19                                  | Pos. Mod<br>9-10 | Pos. Lg<br>114-125                   | Pos. Lg<br>62-68  | Pos. Mod<br>4-5                      | Pos. Mod<br>4-5 | 161-176  | 86-95        |

**Table 3. Summary of Fish, Wildlife, and Recreation Economic Effects in the Sacramento River Region (in Millions of Dollars)**

Table 4. Summary of Fish, Wildlife, and Recreation Economic Effects in the San Joaquin River Region (in Millions of Dollars)

| EXISTING CONDITIONS | NO-ACTION | SPORT FISHING FOR ANADROMOUS FISH <sup>a</sup> |              | (Other Water-Based Recreation Activities for Rivers) |              | Water-Based Activities At Reservoirs |              | Wildlife-Based Recreation Activities |              | Total |
|---------------------|-----------|--|--------------|--|--------------|--------------------------------------|--------------|--------------------------------------|--------------|-------|
|                     |           | Spending                                       | Net Benefits | Spending   | Net Benefits | Spending                             | Net Benefits | Spending                             | Net Benefits |       |
| EXISTING            | NA        | NA   | 14           | 11   | 42           | 25                                   | 4            | 4                                    | 60           | 40    |
| CONDITIONS          |           |  |              |  |              |                                      |              |                                      |              |       |
| ALTERNATIVE 1A      |           | Pos. Sm  | 25-26        | Pos. Sm  | 19-20        | Pos. Mod                             | 73-76        | Pos. Mod                             | 44-46        | 70-74 |
| ALTERNATIVE 1B      |           | Pos. Sm  | 25-26        | Pos. Sm  | 19-20        | Pos. Mod                             | 73-76        | Pos. Mod                             | 44-46        | 70-74 |
| ALTERNATIVE 1C      |           | Pos. Mod                                       | 26-27        | Pos. Mod   | 20-21        | Pos. Lg                              | 77-84        | Pos. Lg                              | 46-50        | 73-79 |
| ALTERNATIVE 2A      |           | Pos. Sm  | 25-26        | Pos. Sm  | 19-20        | Pos. Mod                             | 73-76        | Pos. Mod                             | 44-46        | 70-74 |
| ALTERNATIVE 2B      |           | Pos. Mod                                       | 26-27        | Pos. Mod   | 20-21        | Pos. Lg                              | 77-84        | Pos. Lg                              | 46-50        | 73-79 |
| ALTERNATIVE 2D      |           | Pos. Sm  | 25-26        | Pos. Sm  | 19-20        | Pos. Mod                             | 73-76        | Pos. Mod                             | 44-46        | 70-74 |
| ALTERNATIVE 2E      |           | Pos. Mod                                       | 26-27        | Pos. Mod   | 20-21        | Pos. Lg                              | 77-84        | Pos. Lg                              | 46-50        | 73-79 |
| ALTERNATIVE 3A      |           | Pos. Sm  | 25-26        | Pos. Sm  | 19-20        | Pos. Mod                             | 73-76        | Pos. Mod                             | 44-46        | 70-74 |
| ALTERNATIVE 3B      |           | Pos. Mod                                       | 26-27        | Pos. Mod   | 20-21        | Pos. Lg                              | 77-84        | Pos. Lg                              | 46-50        | 73-79 |
| ALTERNATIVE 3E      |           | Pos. Mod                                       | 26-27        | Pos. Mod   | 20-21        | Pos. Lg                              | 77-84        | Pos. Lg                              | 46-50        | 73-79 |
| ALTERNATIVE 3H      |           | Pos. Mod                                       | 26-27        | Pos. Mod   | 20-21        | Pos. Lg                              | 77-84        | Pos. Lg                              | 46-50        | 73-79 |
| ALTERNATIVE 3I      |           | Pos. Mod                                       | 26-27        | Pos. Mod   | 20-21        | Pos. Lg                              | 77-84        | Pos. Lg                              | 46-50        | 73-79 |

NOTE: <sup>a</sup> values are included in the "Other Water-Based Recreation Activities for Rivers" category.

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Table 5. Summary of Fish, Wildlife, and Recreation Economic Effects in the SWP and CVP Service Areas Outside the Central Valley (in Millions of Dollars)

| Configuration         | Sport Fishing for Anadromous Fish |              | Other Water-Based Recreation Activities for Rivers |              | Water-Based Activities At Reservoirs |              | Wildlife-Based Recreation Activities |              | Total |
|-----------------------|-----------------------------------|--------------|--|--------------|--------------------------------------|--------------|--------------------------------------|--------------|-------|
|                       | Spending                          | Net Benefits | Spending   | Net Benefits | Spending                             | Net Benefits | Spending                             | Net Benefits |       |
| Configuration 1A      | 203-212                           | 187-196      | 203-212  | 187-196      | 203-212                              | 187-196      | 203-212                              | 187-196      | 122   |
| Configuration 1B      | 203-212                           | 187-196      | 203-212  | 187-196      | 203-212                              | 187-196      | 203-212                              | 187-196      | 132   |
| Configuration 1C      | 195-202                           | 180-186      | 195-202  | 180-186      | 195-202                              | 180-186      | 195-202                              | 180-186      | NA    |
| Configuration 2A      | 203-212                           | 187-196      | 203-212  | 187-196      | 203-212                              | 187-196      | 203-212                              | 187-196      | NA    |
| Configuration 2B      | 195-202                           | 180-186      | 195-202  | 180-186      | 195-202                              | 180-186      | 195-202                              | 180-186      | NA    |
| Configuration 2D      | 195-202                           | 180-186      | 195-202  | 180-186      | 195-202                              | 180-186      | 195-202                              | 180-186      | NA    |
| Configuration 2E      | 195-202                           | 180-186      | 195-202  | 180-186      | 195-202                              | 180-186      | 195-202                              | 180-186      | NA    |
| Configuration 3A      | 203-212                           | 187-196      | 203-212  | 187-196      | 203-212                              | 187-196      | 203-212                              | 187-196      | 178   |
| Configuration 3B      | 195-202                           | 180-186      | 195-202  | 180-186      | 195-202                              | 180-186      | 195-202                              | 180-186      | 178   |
| Configuration 3E      | 195-202                           | 180-186      | 195-202  | 180-186      | 195-202                              | 180-186      | 195-202                              | 180-186      | 178   |
| Configuration 3H      | 195-202                           | 180-186      | 195-202  | 180-186      | 195-202                              | 180-186      | 195-202                              | 180-186      | 178   |
| Configuration 3I      | 195-202                           | 180-186      | 195-202  | 180-186      | 195-202                              | 180-186      | 195-202                              | 180-186      | 178   |
| Existing Conditions   | NA                                | NA           | NA   | NA           | NA                                   | NA           | NA                                   | NA           | 122   |
| No Action Alternative | NA                                | NA           | NA   | NA           | NA                                   | NA           | NA                                   | NA           | 178   |

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Table 6. Summary of Fish, Wildlife, and Recreation Economic Effects by Region (in Millions of Dollars)

| Configuration         | Delta Region        |          | Bay Region          |                  |                           |                              | Sacramento River Region |                     | San Joaquin River Region |                     | SWP and CVP Service Areas |                     |
|-----------------------|---------------------|----------|---------------------|------------------|---------------------------|------------------------------|-------------------------|---------------------|--------------------------|---------------------|---------------------------|---------------------|
|                       | Recreation Benefits | Spending | Recreation Benefits | Recreation Value | Commercial Salmon Harvest | Commercial Salmon Net Income | Recreation Spending     | Recreation Benefits | Recreation Spending      | Recreation Benefits | Recreation Spending       | Recreation Benefits |
| Configuration 1A      | 414-430             | 277-286  | 24-25               | 30-33            | 35-36                     | 15-16                        | 153-161                 | 81-87               | 105-110                  | 70-74               | 185-191                   | 171-176             |
| Configuration 1B      | 420-436             | 284-297  | 24-25               | 30-33            | 35-36                     | 15-16                        | 153-161                 | 81-87               | 105-110                  | 70-74               | 195-202                   | 180-186             |
| Configuration 1C      | 420-436             | 284-297  | 24-25               | 30-33            | 35-36                     | 15-16                        | 160-164                 | 85-94               | 110-119                  | 73-79               | 195-202                   | 180-186             |
| Configuration 2A      | 411-428             | 281-294  | 23-24               | 28-29            | 33-34                     | 13-14                        | 152-160                 | 81-86               | 105-110                  | 70-74               | 203-212                   | 187-196             |
| Configuration 2B      | 411-428             | 281-294  | 23-24               | 28-29            | 33-34                     | 13-14                        | 159-163                 | 85-93               | 110-119                  | 73-79               | 203-212                   | 187-196             |
| Configuration 2D      | 420-436             | 284-297  | 24-25               | 30-33            | 35-36                     | 15-16                        | 153-161                 | 81-86               | 105-110                  | 70-74               | 203-212                   | 187-196             |
| Configuration 2E      | 429-456             | 295-318  | 24-25               | 30-33            | 35-36                     | 15-16                        | 160-164                 | 85-93               | 110-119                  | 73-79               | 203-212                   | 187-196             |
| Configuration 3A      | 439-480             | 298-326  | 25-28               | 33-36            | 37-40                     | 17-19                        | 154-163                 | 82-88               | 105-110                  | 70-74               | 203-212                   | 187-196             |
| Configuration 3B      | 439-480             | 298-326  | 25-28               | 33-36            | 37-40                     | 17-19                        | 161-176                 | 86-95               | 110-119                  | 73-79               | 203-212                   | 187-196             |
| Configuration 3E      | 439-480             | 298-326  | 25-28               | 33-36            | 37-40                     | 17-19                        | 161-176                 | 86-95               | 110-119                  | 73-79               | 203-212                   | 187-196             |
| Configuration 3H      | 439-480             | 298-326  | 25-28               | 33-36            | 37-40                     | 17-19                        | 161-176                 | 86-95               | 110-119                  | 73-79               | 203-212                   | 187-196             |
| Configuration 3I      | 439-480             | 298-326  | 25-28               | 33-36            | 37-40                     | 17-19                        | 161-176                 | 86-95               | 110-119                  | 73-79               | 203-212                   | 187-196             |
| Existing conditions   | 226                 | 159      | 9                   | 8                | 27                        | 11                           | 86                      | 46                  | 60                       | 40                  | 132                       | 122                 |
| No Action Alternative | 400                 | 270      | 23                  | 28               | 33                        | 13                           | 146                     | 79                  | 102                      | 68                  | 193                       | 178                 |

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No major impacts on recreationists or recreation workers are anticipated under the No Action Alternative, except that as population increases, existing resources would be stressed. Impacts on recreationists and recreation workers are, of course, intimately tied to the construction of new facilities. Impacts on this group are summarized in Table 7.

Table 6 describes the existing conditions, No Action Alternative, and CALFED alternative resource conditions for economic variables used to assess fish, wildlife, and recreation resources.

## **DELTA REGION**

### **RECREATION LAND USE**

Projects located in the Delta Region, or that could affect land uses in the region, are the Central Valley Project Improvement Act (CVPIA) Project and the Los Vaqueros Reservoir Project.

The CVPIA project includes dedication of 800,000 acre-feet of water for fish and wildlife, Level IV refuge water, restoration payments, and operation of the Shasta temperature control device. An effort is underway to describe the process for allocating the Section 3406b(2) water on an annual basis and to acquire the refuge water. The temperature control device is in place. Potentially significant recreation land use impacts include converting existing agricultural or other uses to dedicated fish and wildlife uses.

The Los Vaqueros Reservoir Project is under construction and is expected to be operational in 1997. Potentially significant recreation land use impacts include converting existing open space or other uses to reservoir project uses.

### **RECREATIONAL OPPORTUNITIES**

Historical land use trends are expected to continue through the year 2020. Population in the Primary Zone of the Delta is expected to continue to decrease, while population density in the Secondary Zone and in adjacent urban areas will continue to expand, replacing agricultural land uses with urban land uses. Since most recreational visitors to the Delta come from within a 40-mile radius of the Delta, the increased population is expected to result in increased stress on existing recreational resources. Adverse impacts on fisheries and wildlife habitat noted in other sections of this report will result in potentially significant reductions in the recreational opportunities associated with these resources. Increased development of land-based recreational facilities (such as parks, camping and picnic areas, and pedestrian and cycling facilities) and water-based activities (such as boating and marinas, fishing, swimming, and water-skiing) may place additional stress on terrestrial and aquatic habitat, leading to further reductions or trade-offs in available recreational opportunities.

In the Delta Region, implementation of the No Action Alternative would result in potentially significant impacts on recreation. The 2020 level of development would result in an increase in population throughout the State of California. The increase in population would place stress on existing Delta and Bay region recreation resources, some of which are already considered to be inadequate (California State Parks 1997).

### **FISH, WILDLIFE & RECREATION ECONOMICS**

Population growth in the five counties that comprise the Delta Region could substantially increase recreational use of the Delta's fish, wildlife, and recreation resources, resulting in increased recreation-related spending and benefits in the region. According to projections prepared by the California Department of Finance (1997), the population of the Delta

|   | Alternative 1   | Alternative 2   | Alternative 3   |
|---|---|---|---|
| <p><b>Recreationists and Recreation Workers</b></p> | <p>Ecosystem Restoration Program in the Delta Region could result in impacts to some existing recreation resources, such as relocation of marinas, speed limits on boats, etc. and therefore negatively impact recreation workers and recreationists. However, the overall impact to recreation is expected to be beneficial as habitat improvements result in greater abundance of wildlife and fisheries and additional scenic areas for environmental enthusiasts. Additionally, the ERPP should create jobs in environmental education and wildlife viewing excursions. The Water Quality Program, Including Watershed Management Coordination should also result in improved recreation opportunities.</p> | <p>Same as Alternative 1, plus additional wetland habitat created in Configurations 2E and 2D would provide additional beneficial impacts to recreationists and potentially create additional recreation jobs in the Delta Region. Any recreation facilities displaced due to construction of storage and conveyance in the Delta, San Joaquin, and Sacramento regions could adversely impact recreationists and result in jobs lost.</p> | <p>Same as Alternative 1, plus construction of isolated facility could permanently close or relocate some recreation facilities in the eastern Delta. Any recreation facilities displaced due to construction of other storage and conveyance projects in the Sacramento and San Joaquin regions could adversely impact recreationists and result in jobs lost.</p> |

**Table 7. Social Well Being Related to Recreation Resources Impact Summary**

Region is projected to increase by 54% between 1995 and 2020. Trends not related to population growth, such as the conversion of wildlife-friendly alfalfa and pasture crops to vineyards, also may affect recreation related to hunting and wildlife viewing in the Delta Region.

Additionally, implementation of the CVPIA could affect future recreation use in the Delta by improving fishing conditions for anadromous species in Delta waters. With fishery habitat improvements implemented under the CVPIA, changes in recreation spending and benefits related to sport fishing could be relatively large (more than 10%).

Based on additional recreation use generated by regional population growth and increased use associated with the CVPIA, spending in the region related to recreational use of the Delta is projected to total approximately \$400 million by 2020. Benefits accruing to Delta recreationists are projected to total \$270 million under the No Action Alternative.

Commercial fishing for crayfish and baitfish species in the Delta and Suisun Bay would not change appreciably under No Action Alternative conditions relative to current resource conditions. Harvest revenue and net income generated by commercial fishing have not been estimated but are assumed to be minor in the context of the regional economy.

## **BAY REGION**

Impacts on recreation land use and recreational opportunities under the No Action Alternative would be similar to those described for the Delta Region.

## **FISH, WILDLIFE & RECREATION** **ECONOMICS**

Economic activity associated with sport fishing for anadromous species in Bay and coastal waters could increase under No Action Alternative conditions from implementation of the CVPIA. (Regional population growth, although adding pressure on the fishery, would not necessarily result in increased fishery-related economic activity because catch is regulated by state and federal resource management agencies.)

Implementation of the CVPIA could result in small (less than 4%) increases in recreation expenditures and benefits in the North Coast Subregion and large (more than 10%) increases in the San Francisco and Central Coast Subregions relative to current levels. (No action levels of spending and benefits associated with recreational fishing for anadromous species in San Francisco and San Pablo bays are addressed as part of the San Francisco Subregion.) Table 8 shows projected levels of recreation expenditures for and benefits of ocean sport fishing for salmon under 2020 No Action Alternative conditions.

Based on additional recreation use generated by regional population growth and increased use associated with the CVPIA, spending in the Bay Region (including outer bay and nearshore areas) related to ocean salmon sport fishing is projected to total approximately \$23 million by 2020. Benefits accruing to ocean salmon sport fishing anglers are projected to total \$28 million under No Action Alternative conditions.

Economic activity associated with commercial fishing for anadromous species in bay and coastal waters could increase under no action conditions due to implementation of the CVPIA. (Regional population growth, while adding pressure on the fishery, would not necessarily result in increased fishery-related economic activity because catch is regulated by state and

| Subregion     | Expenditures (in millions) | Benefits (in millions) |
|---------------|----------------------------|------------------------|
| North Coast   | \$6                        | \$11                   |
| San Francisco | \$8                        | \$8                    |
| Central Coast | \$9                        | \$9                    |

**Table 8. Recreation Spending and Benefits of Ocean Sport Fishing for Salmon Under the No Action Alternative**

federal resource management agencies.) Improvements in fishery habitats under the CVPIA could substantially increase ocean commercial harvest values and net income derived from the catch of salmon.

existing land uses to open space uses could be a significant recreation land use impact of the project.

## SACRAMENTO RIVER REGION

### RECREATIONAL OPPORTUNITIES

#### RECREATION LAND USE

Projects located in the Sacramento River Region, or that could affect land uses in the region, include the CVPIA Project, the Interim Re-Operation of Folsom Reservoir, the Sacramento River Flood Control System Evaluation, and the Stone Lakes NWR Project.

Reoperation of the Folsom Reservoir could result in impacts on existing recreation activities at the reservoir. The extent and type of impacts would vary, depending on the amount of flood storage required. Impacts would result from drawdown of the reservoir in late fall for flood protection. Similarly, benefits to recreation could be realized downstream of the reservoir if releases were greater than existing conditions.

Potentially significant land use impacts of the CVPIA Project were identified for the Delta Region. The interim re-operation of Folsom Reservoir would dedicate more storage space to flood control. Operation was modified beginning in 1994. Conversion of existing land uses for flood control uses could result in a potentially significant impact on recreation land use.

Impacts associated with increased intensity of use of streams and riparian areas would be similar to those described for the Delta Region. Declines in fisheries and terrestrial and aquatic habitat described in other resource sections of this report are expected to have significant adverse impacts on recreational opportunities involving fishing and nature interpretation.

Phases II and III of the Sacramento River Flood Control System Evaluation are under construction. Potentially significant recreation land use impacts include conversion of agricultural and open space uses to accommodate flood control facilities. For the Stone Lakes NWR Project, land acquisition and restoration activities are underway. Converting

### FISH, WILDLIFE & RECREATION ECONOMICS

Under the No Action Alternative, recreation-related expenditures and benefits would increase substantially as a result of the 69% increase in population projected by the California Department of Finance (1997) for the Sacramento River Region between 1995 and 2020. Additionally, a number of projects and actions, including reoperation of Folsom

Reservoir, development of the Stone Lakes NWR, and implementation of the CVPIA, could affect recreation-related economic activity in the Sacramento River Region under the No Action Alternative. Trends not related to population growth, such as converting crops that are associated with wildlife habitat (for example, rice) to other types of crops, also may affect recreation related to hunting and wildlife viewing in the Sacramento River Region.

Reoperation of Folsom Reservoir could affect existing recreation activities at the reservoir. For example, impacts could result from drawdown of the reservoir in late fall for flood protection. The extent of impacts and resulting effects on recreation spending and benefits would depend on the amount of storage required during different water-year types. Losses of recreation at the reservoir could be at least partially offset by benefits to recreational resources downstream of the reservoir resulting from higher releases at specific times of year. The net effect of Folsom Reservoir reoperation on recreation spending and benefits most likely would be small (reduced by less than 4%).

The Stone Lakes NWR provides opportunities for nonconsumptive recreation activities, such as nature walks and wildlife viewing. Ultimate development of the wildlife refuge would generate a moderate (5 to 9%) increase in spending and benefits associated with wildlife-related recreation in the Sacramento River Region.

Implementation of the CVPIA could result in large (more than 10%) increases in use of recreational resources such as fisheries in the Sacramento, Feather, American, and Yuba rivers and small (1% or less) decreases in use of reservoirs such as Shasta and Oroville. Wildlife refuges in the region could experience large (10% or more) increases in use because of improved wildlife habitat conditions in refuges related to the CVPIA.

Based on population growth and effects of projects under No Action Alternative

conditions, 2020 levels of recreation-related expenditures and benefits are projected to total \$129 million and \$70 million, respectively, in the Sacramento Region.

## **SAN JOAQUIN RIVER REGION**

### **RECREATION LAND USE**

Projects located in the San Joaquin River Region, or that could affect land uses in the region, are the CVPIA Project, the Monterey Agreement, and the New Melones Conveyance Project.

Potentially significant land use impacts of the CVPIA Project were identified for the Delta Region. The Monterey Agreement revises the formula used to allocate SWP water, retires 45,000 acre-feet of agricultural entitlement, transfers 130,000 acre-feet of entitlement from agriculture to manufacturing and industrial use, allows the sale of the Kern Fan element of the Kern Water Bank to agricultural contractors, and changes allowable operations at Castaic Lake and Lake Perris. The Agreement was implemented in 1995; potential recreation land use impacts could result from changes in the availability of water for various land uses. The impacts are not anticipated to be significant.

The New Melones Conveyance Project conveys water to the Stockton East Water District and Central San Joaquin Water Conservation District for use near and in Stockton. The project recently constructed and is operational. Thus, no new significant adverse recreation land use impacts are anticipated.

### **RECREATIONAL OPPORTUNITIES**

Retirement of agricultural lands on the west side of the San Joaquin River Region and their conversion to recreational uses would result in a positive impact on recreation in the region.

## **FISH, WILDLIFE & RECREATION** **ECONOMICS**

Under No Action Alternative conditions, economic activity generated by recreation use of regional resources would increase as a result of the 68% increase in population projected by the California Department of Finance (1997) for the San Joaquin River Region between 1995 and 2020.

Implementation of the CVPIA also would affect economic activity associated with recreational use of many of the region's rivers, reservoirs, and wildlife refuges. Changes in economic activities related to reservoirs most likely would be small (less than 4%) and would be related to reductions in use. Spending and benefits generated by use of the region's rivers probably would increase by a small (4% or less) amount. Spending and benefits generated by visitation at the region's wildlife refuges most likely would increase by a large (10% or more) amount relative to existing levels.

Based on regional population growth and likely effects of the CVPIA, No Action Alternative levels of recreation-related expenditures are projected at \$102 million and \$68 million, respectively, in the San Joaquin River Region.

## **SWP AND CVP SERVICE AREAS OUTSIDE THE CENTRAL VALLEY**

### **RECREATION LAND USE**

Projects located in the SWP and CVP Service Areas Outside the Central Valley, or that could affect recreation land uses in the region, are the CVPIA Project, the Monterey Agreement, the Coastal Aqueduct Project, the Kern Water Bank Project, the Metropolitan Water District of Southern California's (MWD's) Eastside Reservoir Project, and the Semitropic Water Storage District Groundwater Banking Project.

Potentially significant recreation land use impacts of the CVPIA Project and Monterey Agreement were identified for the Delta and San Joaquin River regions, respectively.

The Coastal Branch II of the Coastal Aqueduct Project would provide State Water Project (SWP) water for manufacturing and industrial use in San Luis Obispo and Santa Barbara counties. Construction began in 1993 on Coastal Branch II, and the project is expected to be operational in 1997. Potentially significant recreation land use impacts include conversion of agricultural and open space uses to accommodate conveyance facilities.

The Kern Water Bank Project would develop storage capacity to augment the SWP's dependable supply. Components addressed in this study include only those aspects that recently have been completed and are currently being operated. Conversion of land uses for storage capacity could be a significant recreation land use impact of the project.

MWD's Eastside Reservoir Project would provide emergency storage following earthquakes, furnish supplies during droughts, and assist in meeting peak summer demands. The project is under construction. Conversion of land uses for storage capacity could be a significant recreation land use impact of the project.

The Semitropic Water Storage District Groundwater Banking Project would allow MWD to recharge and extract SWP water in the Semitropic Water Storage District. No significant recreation land use impacts are anticipated.

### **RECREATIONAL OPPORTUNITIES**

No impacts on recreation are anticipated in the SWP and CVP Service Areas Outside the Central Valley under the No Action Alternative.

## FISH, WILDLIFE & RECREATION ECONOMICS

Spending and benefits associated with recreational use of reservoirs in the SWP and CVP Service Areas could be affected by population growth, projects such as the CVPIA and MWD's Eastside Reservoir, and actions such as increased CVP and SWP Delta exports. Important lakes that could be affected include Castaic, Pyramid, Silverwood, and Perris.

Based on the 46% increase in population growth projected by the California Department of Finance (1997) for counties containing these lakes, recreation spending and benefits could annually total a projected \$193 million and \$178 million, respectively, by 2020.

### ***Comparison of CALFED Alternatives to No Action Alternative***

#### **ALL REGIONS**

#### **RECREATION LAND USE**

For this program-level analysis, the specific locations of improvements associated with CALFED actions have not been identified for any variation of any alternative. Thus, the consistency of project alternatives with general plan land use designations or zoning are not evaluated herein. The potentially significant impact of inconsistency with local and regional plans would be associated with any CALFED action resulting in a change to an existing land use. Conversely, a potentially significant beneficial impact on recreation could be associated with land use changes that increase the amount or improve the quality of existing recreation land use. This impact applies to all regions and all configurations, even if not specifically restated under regional discussions

below. (This impact is included in impact summary tables.)

#### **RECREATIONAL OPPORTUNITIES**

Table 9 summarizes potential impacts on recreation facilities. Impacts on recreation vary between configurations only with respect to the storage and conveyance components proposed.

#### **FISH, WILDLIFE & RECREATION ECONOMICS**

Table 6 describes the existing conditions, No Action Alternative, and CALFED alternative resource conditions for economic variables used to assess fish, wildlife, and recreation resources. These effects are summarized below by region.

Changes in recreation spending and user benefits are largest in regions where several recreation-related activities would be affected. Effects generally are highest in the Delta Region (increases of \$11 to \$80 million annually), where the existing recreation industry is sizeable (1995 spending estimated at \$226 million). Effects are smallest in the Bay Region (\$3 to \$12 million annually) and SWP and CVP Service Areas Outside the Central Valley (\$2 to \$19 million annually), where only one or two activities would be affected. A small, adverse impact is predicted for the SWP and CVP Service Areas Outside the Central Valley under Configuration 1A as a result of the effects on reservoir recreation from water use efficiency actions, including implementing conservation measures and accommodating few, if any, new water transfers.

| Region                           | No Action | 1A, 1B   | 1C, 2B, 2E, 3B, 3E, 3H, 3I   | 2A, 2D, 3A |
|----------------------------------|-----------|--|--|------------|
| Delta                            |           | Potentially significant adverse impacts to boating circulation patterns, available launching facilities, and other recreation facilities due to temporary and permanent closure during construction of habitat restoration projects, Levee System Integrity Program projects and south Delta modifications. Mitigation: Provide for temporary or permanent rerouting for boaters, identify like-kind launching and other recreation facilities for use in the vicinity of temporarily closed facilities or restrict facility closures to the off-peak recreation season. For permanent closures, permanent replacement facilities must be developed. Mitigations should be developed in the context of the comprehensive planning effort for the Recreation component of CALFED. |  |            |
|                                  |           | Visitor use anticipated to increase as a result of improved habitat, wildlife and water quality. This could be a beneficial impact or an adverse impact depending on the capacity of recreation resources. Mitigation: Additional recreation facilities should be developed to accommodate increased demand for recreation opportunities.  |  |            |
|                                  |           |  | In Alternative 3 only there are also potentially significant impacts to land-based recreation facilities during construction of open channel isolated facility or pipeline. Mitigation: Provide like-kind recreation facilities or restrict construction to off-peak recreation season.  |            |
| Bay                              | No impact | Impacts to Bay Region similar to those described for Delta Region (except those related to isolated conveyance), but on smaller scale.   |  |            |
| Sacramento and San Joaquin River | No impact |  | Temporary and permanent closure of recreation facilities could result in potentially significant impacts during construction of surface storage and groundwater storage projects. Mitigation: Access to like kind facilities should be provided during temporary closures or construction must occur off-season. Permanent replacements must be provided for permanent closures. |            |
|                                  |           |  | New on-stream storage facilities could result in new recreation facilities. This is a beneficial impact.   |            |
|                                  |           | Temporary and permanent closure of recreation facilities could result in potentially significant impacts due to construction for ERPP and Levee System Actions. Mitigation: Replace any displaced facilities with like kind facilities or, temporary closures can be mitigated by scheduling construction during off-peak recreation season.   |  |            |
|                                  |           | Visitor use anticipated to increase as a result of improved habitat, wildlife, and water quality. This is a potentially significant adverse impact if sufficient recreation resources are not available to support increased recreation use. However, this is also a potentially beneficial impact. Mitigation: Continue to develop recreation facilities to meet recreation demand.   |  |            |
| SWP-CVP Service Areas            | No impact | No significant impacts to recreation are anticipated in this region.   |  |            |

**Table 9. Summary of Impacts to Recreation Facilities, Opportunities, and Use**

## **DELTA REGION**

A summary of potential impacts on recreation facilities, opportunities, and use in the Delta Region for each alternative is shown in Table 10.

### **ALTERNATIVE 1**

#### **Ecosystem Restoration Program**

The character of the impacts of the Ecosystem Restoration Program would be similar for all alternatives; however, the magnitude would vary by region according to the number of acres and the existing use of lands converted for restoration.

#### ***Recreation Land Use***

The Ecosystem Restoration Program would convert from approximately 105,000 to 135,000 acres of land in the Delta Region to habitat and ecosystem restoration, levee setbacks, and floodways. Specific direct and construction-related land use impacts on the three categories of land use in consideration (agricultural, open space/habitat, and developed) would depend on the actual location of the modifications and improvements, and are considered potentially significant.

The Ecosystem Restoration Program would improve various areas of the Delta, Sacramento River, and San Joaquin River regions for habitat restoration. Given existing spatial land use patterns, most of these lands are likely to be in agricultural use currently. Conversion of agricultural land use to habitat could result in a positive impact on recreation land use.

#### ***Recreational Opportunities***

Ecosystem Restoration Program actions that would affect recreational opportunities or recreation facilities, and increase or decrease recreation use are described qualitatively below.

In general, CALFED actions that could directly affect recreation in the Delta Region include habitat restoration, species recovery activities, and actions designed to eliminate “stressors” on the ecosystem. The overall impact of these actions is considered beneficial. As conditions in the Delta improve for fish and wildlife by improving habitat, recreational opportunities involving wildlife viewing and fishing would benefit.

**Habitat.** Many of the areas targeted for habitat restoration currently are used for recreation activities, including boating, hunting, wildlife viewing, and sportfishing. Other areas currently used for agriculture would be converted to uses that would be more compatible to recreation. For example, the development of new deep-water areas and tidally influenced channels would create new recreational opportunities for boaters. The restoration of freshwater marshes and tidal wetlands may create new opportunities for hunters.

Although the overall impact of habitat restoration on recreation would be positive, restoration activities may result in some adverse impacts. These impacts primarily would be felt during construction activities, when specific areas may be temporarily closed to the public, and some recreation facilities such as piers or marinas would be temporarily or permanently closed. Additionally, temporary, seasonal, or permanent closure of some Delta waterways could affect current circulation and cruising patterns.

**Species and Species Groups.** Implementation of the species and species groups elements in the Delta Region is intended to result in the recovery of numerous special-status fish and bird species. Several actions designed to protect and recover fisheries also are planned for regions upstream of the Delta and would benefit the Delta as well. In the long term, by improving the sustainability of a species, particularly fish and hunted species such as ducks, impacts on recreation would be positive,

| Recreation Impact                                | Existing Conditions   | No Action  | 1A  | 1B, 1C | 2A, 2B | 2D | 2E  | 3A, 3B, 3E, 3H, 3I |
|--|---|--|---|--------|--------|----|---|--------------------|
| <b>Recreation Facilities</b>                     |   |  |   |        |        |    |   |                    |
| Temporary facility closure during construction   |   |  | Potentially significant adverse impacts to boating circulation patterns, available launching facilities, and other recreation facilities due to temporary closure during construction of habitat restoration projects. Levee System Integrity Program projects and south Delta modifications<br>Mitigation: Provide for temporary rerouting for boaters. Identify like-kind launching and other recreation facilities for use in the vicinity of temporarily closed facilities or restrict facility closures to the off-peak recreation season. Mitigations should be developed in the context of the comprehensive planning effort for the Recreation component of CALFED. |        |        |    | Same as Alternative 1 and 2 plus potentially significant impacts to land-based recreation facilities during construction of open channel isolated facility or pipeline. Mitigation: Provide like-kind recreation facilities or restrict construction to off-peak recreation season. |                    |
| Permanent closure of facilities                  |   |  | Construction for ERPP and Levee System Integrity Program projects could result in permanent closure of existing facilities. This is a potentially significant impact. Mitigation: Displaced facilities should be replaced with like-kind facilities in the vicinity of any displaced facilities. Mitigations should be developed in the context of the comprehensive planning effort for the recreation component of CALFED.  |        |        |    |   |                    |
|  |   |  | Potentially significant due to Mokelumne River floodway and Bouldin Island modifications. Mitigation: Replace displaced facilities with like-kind facilities.   |        |        |    | Operation of open channel isolated facility or pipeline could result in permanent closure of portions of existing recreation facilities and is considered a potentially significant impact. Mitigation: Replace facilities with like-kind in the vicinity of displaced facilities.  |                    |
|  |   |  | Potentially significant impact due to inundation of Tyler Island. Mitigation: Replace displaced facilities with like-kind facilities.   |        |        |    |   |                    |
| Development of new recreation facilities         |   |  | ERPP and Levee Program actions could result in new recreation facilities which is a beneficial impact.  |        |        |    |   |                    |
| <b>Recreation Opportunities</b>                  |   |  |   |        |        |    |   |                    |
| Increased opportunities due to improved habitat  |   |  | ERPP actions should result in increased wildlife viewing, hiking, and fishing opportunities which is a beneficial impact.   |        |        |    |   |                    |
| Constraints on current practices (i.e., boating) |   |  | Potentially unavoidable adverse impact on existing circulation patterns due to imposition of speed limits and temporary and permanent closure of some channels for ERPP actions. Mitigation: In context of comprehensive planning, identify alternative circulation patterns to minimize impacts of restrictions.   |        |        |    |   |                    |
| <b>Recreation Use</b>                            |   |  |   |        |        |    |   |                    |
| Visitor Use                                      | Current recreation demand exceeds resources, especially for boating and fishing facilities. | Visitor use will increase with growing population, increasing demand for recreation resources, and resulting in a potentially significant impact on existing recreation resources. | Visitor use anticipated to increase as a result of improved habitat, wildlife and water quality. This could be a beneficial impact or an adverse impact depending on the capacity of recreation resources. Mitigation: Additional recreation facilities should be developed to accommodate increased demand for recreation opportunities.   |        |        |    |   |                    |

Table 10. Summary of Recreation Impacts in the Delta Region

as recreational opportunities for fishing and hunting also would be sustained.

Because restoration actions would result in increased visitation by birds and other wildlife, the impact on recreation also likely would include expanded opportunities for wildlife viewing, particularly of birds, and the Delta could become a major destination for birders, increasing RVDs in comparison to existing conditions. Commercial enterprises could develop services for visitors, such as guided tours.

**Stressors.** Implementation of the elements of the Ecosystem Restoration Program designed to eliminate or reduce stressors may affect existing recreation. The stressor element includes a requirement to reduce boat traffic and boat speeds in areas where levees or channel islands and their associated shallow-water and riparian habitat are susceptible to wake damage. Reduction of boat traffic in some areas could result in an increase in traffic in other areas, causing congestion during peak-use days in summer. Additionally, mandatory reduction in speed in some areas would create a change in recreation activities from the existing condition. There is currently no speed limit in the Delta except surrounding marinas where speed limits are 5 mph. Although the Ecosystem Restoration Program does not currently specify proposed speed requirements, new regulations could alter jet ski and boat behavior and potentially could decrease the number of use-days for boating in the Delta. Such a reduction is considered a potentially significant impact.

### ***Fish, Wildlife & Recreation Economics***

A number of actions in the Ecosystem Restoration Program could improve spawning, rearing, and survival conditions for anadromous species caught in the Delta Region, including chinook salmon. Improved spawning, rearing, and survival conditions should lead to increased populations of sport fish in the Delta Region. Larger populations are expected to lead to increased recreational fishing, generating

positive changes in recreational spending and benefits in the Delta Region.

Although these actions could lead to larger populations of chinook salmon originating from the Central Valley river system, it is difficult to assess the extent of economic benefit to the recreational fishing industry in the Delta Region. Ocean populations comprise salmon originating from various systems along the Pacific Coast, including Klamath and Snake river salmon, whose populations are protected by catch restrictions. Because populations are intermingled, restrictions on the catch of Klamath and Snake river salmon can severely restrict the harvest of Central Valley chinook salmon. Assuming harvest restrictions were eased in the future for protected stocks, increases in the populations of Central Valley chinook salmon would lead to substantially increased catch of salmon, thereby increasing spending by, and net benefits from, anglers in the Delta Region.

Commercial fishing for crayfish and baitfish species in the Delta and Suisun Bay would not change appreciably under the Program Alternatives relative to no action conditions. Harvest revenue and net income generated by commercial fishing have not been estimated but are assumed to be minor in the context of the regional economy.

The Ecosystem Restoration Program also is expected to result in large, positive changes in populations of bird species important for wildlife viewing and hunting. A corresponding positive effect is expected on recreation spending and user benefits in the Delta Region.

### ***Social Well Being Related to Recreation***

In Alternative 1, converting agricultural lands to restored habitat would result in a change in the number of jobs for recreation workers. (Jobs also would be lost for farmers, farm workers, and agribusiness, as discussed in the Agricultural Resources Environmental Consequences Technical Report.) The numbers

of jobs anticipated to be affected are discussed in the Regional Economics Environmental Consequences Technical Report. Loss of jobs is considered a potentially significant adverse impact.

Implementation of the Ecosystem Restoration Program in the Delta Region would result in the elimination of some recreation jobs if habitat projects displaced existing recreation facilities. The increase in habitat values overall is anticipated to result in increased recreational opportunity and likely would result in a net gain in recreation-related jobs in the Delta Region.

Displaced recreation workers likely would need to receive social service benefits. Many recreation workers are seasonal and part-time employees, and many are students who look for seasonal employment. Loss of recreation jobs for these individuals likely would cause them to seek temporary employment elsewhere.

Reallocation of water supplies from agricultural uses to fish and wildlife habitat uses may result in improved recreational opportunities and the additional income generated from hunters, birders, and sport fishers visiting wildlife refuges and streams in the region. In addition, aesthetically improved values in rivers and refuge lands and environmental benefits could result in an increase in recreation jobs that is difficult to quantify. A minor benefit of increased water supplies for fish and wildlife habitat uses would be employment opportunities related to environmental restoration, including habitat restoration and structural improvements for such actions as restoration and improvement of refuge facilities and spawning areas in streams. These new jobs could replace a small number of jobs lost in the area.

Because the Ecosystem Restoration Program would result in an increase in fisheries, new jobs could be created in the fisheries sector; however, the number of jobs or level of improvement to existing jobs cannot be quantified. The Regional Economics

Environmental Consequences Technical Report addresses impacts on commercial fishing.

### **Water Quality Program and Coordinated Watershed Management**

Impacts on recreation resources associated with the Water Quality Program are anticipated to be similar for all alternatives in the Delta Region.

#### ***Recreation Land Use***

The Water Quality Program focuses on source control and reducing the release of pollutants into the Bay-Delta system and its tributaries. The program is not anticipated to directly or indirectly affect recreation land use in any CALFED region. "Recreation Land Use" therefore is not discussed for this program under any other region.

#### ***Recreational Opportunities***

The Water Quality Program would provide improved water quality for all users of water from the Delta, including recreational beneficial uses. Improved water quality for the Delta would have several indirect beneficial impacts on recreation. Existing health hazards related to ingesting raw water from the Delta during recreational activities would diminish and water clarity should improve, resulting in an improved aesthetic experience. Water quality is a critical element in making the Delta a thriving ecosystem, which would result in an overall positive impact on recreation. No action in the Water Quality Program is expected to negatively affect recreation. One action in the program to improve management of boat discharges could lead to more stringent regulation.

#### ***Fish, Wildlife & Recreation Economics***

Elements of the Water Quality Program could result in improved fishery, river recreation, and wildlife refuge conditions throughout the Delta

Region. Improved water quality in rivers and in the Delta should lead to healthier anadromous fish populations and improved conditions for water-contact recreation in the Delta Region, resulting in increased spending and user benefits.

### ***Social Well Being Related to Recreation***

Improved water quality in the Delta is anticipated to improve the overall recreation experience in the Delta. The combined effects of the Water Quality Program with the Ecosystem Restoration Program is expected to result in a significantly positive impact on recreationists and potentially would create more jobs for recreation workers. This potentially significant positive impact associated with social well being applies to all configurations in the Delta Region.

### **Levee System Integrity Program**

Impacts on recreation resources associated with the Levee System Integrity Program are anticipated to be similar for all alternatives in the Delta Region.

### ***Recreation Land Use***

The Levee System Integrity Program would improve the integrity of the levee system. Subsidence control could involve shallow flooding and the creation of managed wetlands in certain areas. Impacts of other approaches in the program on recreation land use, such as setback levees and associated habitat, were discussed under the Ecosystem Restoration Program. As with the Ecosystem Restoration Program, agricultural land uses would be most directly affected by Levee System Integrity Program actions. The Levee System Integrity Program is not anticipated to directly affect recreation land use outside the Delta Region; therefore, "Recreation Land Use" is not discussed for the program for other regions.

### ***Recreational Opportunities***

The Levee System Integrity Program is expected to result in overall beneficial impacts on recreation facilities and opportunities. The development of beach slopes associated with levees should result in increased recreational opportunities and facilities, and result in an overall positive impact on recreation. The development of new beach areas also may result in an increase in recreation use.

Some levee projects may require that existing recreation facilities or use be redirected temporarily or permanently; however, which current activities and facilities may be redirected is not known. Impacts could include eliminating existing opportunities in a specific portion of the Delta, such as boat ramps, piers, or marinas.

The Levee System Integrity Program would reduce the risk to land uses from catastrophic breaching of Delta levees. Currently, many recreation areas in the Delta, such as camping facilities and boat launches, are at risk of damage if a levee in the vicinity was breached. The Levee System Integrity Program would reduce the risk.

During construction of levee repairs and levee strengthening, temporary impacts on recreation activities could occur. It also is possible that in some locations repairing or modifying a specific levee could encroach on an existing recreation facility, resulting in a decrease in size or function of the facility or elimination of the facility. If levee projects were designed to provide access to waterfront parcels of useable land on island edges, opportunities for boat-in day use and camping could be created.

### ***Fish, Wildlife & Recreation Economics***

The enhancement of opportunities for levee-associated recreation in the Delta Region under the Levee System Integrity Program could increase sport fishing from banks and increase other types of recreation along rivers in the

Delta, resulting in an increase in recreation spending and user benefits.

### ***Social Well Being Related to Recreation***

Displacement of existing recreation facilities could temporarily or permanently displace recreationists and recreation workers. Replacement facilities could require recreationists and recreation workers to travel farther distances than under current conditions.

### **Water Use Efficiency Program and Water Transfers**

Impacts on recreation resources associated with the Water Use Efficiency Program are anticipated to be similar for all alternatives in the Delta Region.

### ***Recreation Land Use***

The Water Use Efficiency Program is not anticipated to directly or indirectly affect recreation land use any CALFED region. The program relies on incentives, technical assistance, and policies to be implemented by local agencies, rather than mandatory measures and targets for water use efficiency.

### ***Recreational Opportunities***

If water use efficiency improvements reduced wetlands or riparian areas that survive off existing irrigation losses, or if changes in irrigation pricing induced crop changes or acted as a disincentive to after-harvest flooding of fields (especially rice), the amount of beneficial waterfowl habitat may be reduced. This reduction could adversely affect the amount of lands available for recreational hunting or bird watching.

Water use efficiency improvements also could lead to reduced diversions, leaving more water for instream benefits. Instream benefits may include increased flow through a particular reach of stream for a particular year, changes in

the timing of reservoir releases, and decreased diversion impacts on aquatic species. All of these may have a combined beneficial impact on recreational fishing and on other recreational activities such as boating (both instream and on reservoirs).

Water transfers may beneficially affect instream and reservoir recreation. For instance, transfers may allow water to be left in reservoirs, or requirements of a transfer may dictate the timing to result in an instream fishery benefit. Such actions could provide additional benefits for recreation.

### ***Fish, Wildlife & Recreation Economics***

The Water Use Efficiency Program probably would not result in substantial direct effects on fish, wildlife, and recreation economic variables in the Delta Region. Increasing the efficiency of agricultural, urban, and environmental water use could free up water that could enhance fish and wildlife habitats in streams, wildlife refuges, and the Delta, but these potential effects are uncertain. Water transfers could result in adverse and beneficial economic effects on fishery conditions and recreation in the Delta Region; however, the net effect of water transfers on economic variables in the Delta Region also is uncertain.

### **Storage and Conveyance**

### ***Recreation Land Use***

Configurations 1A and 1B do not include components for water storage or conveyance. Configuration 1C includes some enlarged Delta channel capacity, plus potential surface water and groundwater storage. Storage components of Configuration 1C are the same as storage components for other CALFED proposed alternatives. These are, in order of priority, raise existing dams, develop new surface water storage (on-stream or off-stream), and develop new groundwater storage. Potentially significant direct recreation land use impacts of

new or expanded surface water storage would be associated with converting existing land uses for these improvements.

Direct impacts on recreation associated with raising existing dams would be caused by inundation of existing recreation facilities and recreational opportunities currently existing around the perimeter of the reservoir. These facilities could include boat launches, marinas, camping facilities, resorts, fishing spots, piers, and beaches. An enlarged reservoir could provide for improved recreation facilities and opportunities when compared to current conditions. For example, an enlarged reservoir would have greater surface area, providing additional area for boating; and a greater circumference, providing a larger area for lakeside camping facilities, boat launches, marinas, and resorts. Actual opportunities for development of improved recreation facilities and recreational opportunities would depend on the topography and other constraints surrounding existing reservoirs and proposed configurations of an enlarged reservoir.

Impacts associated with developing new off-stream storage reservoirs would depend on the location of the reservoir, the existing facilities in the area of inundation, and the quality of habitat to be inundated. Potential direct adverse impacts on recreation land use could result from converting the existing, underlying land use. For this programmatic analysis, it was assumed that most new reservoir sites would be located in the foothills rather than in flat, valley-bottom areas where agriculture land uses would predominate. Expected land use impacts therefore would involve converting an existing open space to a new open space use (water storage), and could be significant.

The extent of impacts can be determined only after comparing the value of recreation facilities and recreational opportunities to be inundated to those created with a new reservoir. Some types of recreational opportunities and facilities that would be inundated (for example, camping) could be replaced surrounding the new

reservoir. The new reservoir also would provide a significant new recreational opportunity for boating, swimming, and fishing. A conveyance facility of some type would need to be constructed to convey water from the off-stream reservoir to users. Impacts related to the conveyance facility likely would be associated only with construction and would be temporary.

New on-stream storage reservoirs would result in greater impacts on recreation than off-stream reservoirs. In addition to any land area that would be inundated, a new on-stream reservoir also would inundate some length of existing free-flowing river which, depending on the river and the location, may be an important recreation resource for rafting, kayaking, and fishing. Additionally, operation of an on-stream reservoir could result in altered downstream flows and higher or lower water temperatures, both of which could affect existing recreation. A new on-stream reservoir would create new recreational opportunities; however, benefits from new reservoir recreation would not offset impacts on recreation activities in a free-flowing river channel.

Impacts from off-aqueduct storage would depend on the location and area to be inundated. Impacts probably would be less severe than those for on-stream reservoirs; however, impacts could be significant.

Increased or new groundwater storage is not expected to result in direct or indirect impacts on existing land uses in the area.

### *Recreational Opportunities*

No storage facilities are proposed in the Delta Region for Alternative 1. Configuration 1C includes surface storage and groundwater storage upstream of the Delta. Depending on the operation of these upstream storage facilities, impacts on recreation in the Delta Region could result from alteration of existing flows or changes in current water temperature.

Configuration 1A includes “reoperation” of existing water supply facilities, including storage facilities, pumps, and conveyance facilities. The purpose of the reoperation is to provide flow events during the spring outmigration of fishery species using the tributaries to the Delta. It is anticipated that the water required for this reoperation would be provided from water otherwise delivered during the growing season to agricultural needs and would not affect the water supply required for recreation uses.

Configurations 1B and 1C include modifications to conveyance facilities in the south Delta. Configurations 1B and 1C also include improvements to the CVP and SWP to provide additional operational flexibility. Construction of these improvements may temporarily restrict recreation activities, including boating, fishing, hunting, and wildlife viewing in the vicinity of the construction area. Operation of these improvements would result in improved fishery resources and therefore potentially increase visitor use for fishing activities. Depending on the extent of the increase, increased visitor use could stress the existing, limited recreation facilities.

Operation of fish control barriers in the south Delta could negatively affect boating circulation patterns in the area.

Indirect impacts of new storage facilities on recreation land use could include the migration of recreational activities to the new reservoirs over time, and could be significant.

### ***Fish, Wildlife & Recreation Economics***

South-Delta modifications under Alternatives 1A and 1B would result in minor, if any, effects on recreation spending and user benefits in the Delta Region from increases in sport fishing opportunities.

Under Configuration 1C, reservoir recreation could be enhanced by developing surface water storage upstream of the Delta and off-aqueduct

storage south of the Delta, but these storage enhancements are not likely to affect recreation spending or user benefits in the Delta Region.

Table 1 shows the predicted effect of Alternative 1 configurations on the economic variables used to assess impacts on affected activities in the Delta Region. The direction and predicted magnitude of economic effects are indicated. As shown, sport fishing for anadromous fish and other water-based recreation activities on rivers result in major economic impacts in the region, with \$390 million predicted in annual spending by 2020. Small to moderate positive changes in these levels of spending and user benefits are predicted under Alternative 1 configurations.

### ***Social Well Being Related to Recreation***

The SWP and CVP improvements included in Configurations 1B and 1C may improve fishery conditions; however, their impact on sport fishing cannot be quantified. Improved fishery conditions could result in an increase in jobs for recreation workers. Commercial enterprises also could develop services for visitors.

## **ALTERNATIVE 2**

Impacts on recreation and fish, wildlife, and recreation economics associated with implementation of the Ecosystem Restoration Program; the Water Quality Program; the Water Use Efficiency Program; the Levee System Integrity Program; Water Transfers; and Coordinated Watershed Management in the Delta Region are the same for Alternatives 2 and 3 as described for Alternative 1.

### **Storage and Conveyance**

#### ***Recreation Land Use***

Potential direct and construction-related impacts on recreation land uses in the Delta Region are anticipated to be similar to those described for Alternative 1. The principal difference between

Alternatives 1 and 2 involves the components for water storage or conveyance. Alternative 2 includes significant modifications of through-Delta channels to improve water conveyance across the Delta. Channel widening and island flooding would require purchasing and converting agricultural and potentially other land uses. Recreation land use impacts of the modifications are considered potentially significant.

For instance, Configuration 2A envisions the purchase of a 500-foot strip of land along about 30 miles of the Mokelumne River. Existing land uses along this 2,000-acre strip are primarily agricultural. In addition, actions such as flooding the McCormack-Williamson Tract would inundate another 1,600 to 1,700 acres. Flooding Delta islands for increased conveyance purposes primarily would affect existing agricultural land uses on these islands. Other ancillary island land uses would be affected and need to be relocated, such as highways and roads, spot commercial uses, and scattered residential uses. These scattered residential uses are often on the perimeter of the island adjacent to the levee in order to provide the residents access to the recreational benefits of the waterway.

Configuration 2B potentially would implement the same Delta modifications described under Configuration 2A, and would add surface water and groundwater storage components. Potential recreation land use impacts of new or expanded surface water storage are discussed under Alternative 1, and could be significant.

Configuration 2E would eliminate certain in-channel conveyance and add additional habitat from inundating Tyler Island. Primarily agricultural land use would be converted for conveyance features.

Potential indirect and operational impacts on recreation land uses in the Delta are anticipated to be similar to those described under Alternative 1.

## *Recreational Opportunities*

Depending on the operation of upstream storage facilities in Configurations 2B and 2E, potentially significant impacts on recreation in the Delta Region could result from altering existing flows or changes in current water temperature. Construction and operation of the several conveyance facilities included in the configurations of Alternative 2 would result in the same impacts as those described for similar facilities included in Alternative 1.

Construction of the Mokelumne River Floodway modifications and inundating Tyler Island under Configuration 2E may result in temporary impacts on recreation during construction. Replacement of water-dependent recreational opportunities would not offset the loss of land-based activities.

Other habitat improvements and setback levees included in Alternative 2 that would improve conveyance of water would result in temporary construction impacts on recreation. These improvements are expected to provide long-term benefits to recreation.

## *Fish, Wildlife & Recreation Economics*

The conveyance modifications in Configuration 2A would affect recreation spending and benefits similar to Configuration 1B. Under Configuration 2B, some minor indirect effects on recreation spending and user benefits could result from developing surface water storage upstream of the Delta on Sacramento River and San Joaquin River tributaries, and south of the Delta off the aqueduct. The conveyance modifications would be the same as those under Configuration 2A. The overall effect of these enhancements on recreation spending and user benefits in the Delta Region would be minor.

Under Configuration 2E, storage modification would include surface water storage upstream of the Delta on Sacramento River and San Joaquin River tributaries, and off the aqueduct south of the Delta, but these enhancements are not likely

to affect recreation spending or user benefits in the Delta Region. Conveyance modifications include modifications near Tyler Island, a floodway along the Mokelumne River, and south-Delta modifications. Habitat created as part of these modifications could generate new waterfowl hunting opportunities, resulting in increased spending and user benefits in the Delta Region.

Table 1 shows the predicted effect of Alternative 2 configurations on the economic variables used to assess impacts on affected activities in the Delta Region. Small to moderate positive changes are predicted in spending and user benefits of sport fishing for anadromous fish, and moderate to large positive changes are predicted in spending on other water-based recreation activities along rivers under Alternative 2 configurations.

### ***Social Well Being Related to Recreation***

Creation of additional wetland habitat in Configuration 2E could provide additional recreation area and potentially could provide jobs for recreation workers.

## **ALTERNATIVE 3**

### **Storage and Conveyance**

#### ***Recreation Land Use***

Alternative 3 adds an isolated facility (new open channel or buried pipeline) to the through-Delta modifications of Alternative 2 to move water through and around the Delta. Potential direct land use impacts from a new isolated facility would be different for an open channel or a buried pipeline. Creation of an open-channel isolated conveyance would require permanently converting underlying land uses from agriculture (primarily) to open space; estimates of acreages involved are provided below. Construction of a buried pipeline isolated conveyance would temporarily affect surrounding land uses. Existing affected land

uses could resume after completion of the pipeline construction.

Potential impacts for Configuration 3A are similar to those described for Configuration 2A, except for the proposed flooding of McCormack-Williamson Tract. An open-channel isolated conveyance would require the purchase and conversion of a 1,000-foot-wide alignment for the canal. Assuming a 45-mile conveyance canal, about 4,000 to 5,000 acres of land would be purchased. The agricultural land use component of that right-of-way could range from 2,000 to 5,000 acres. Recreation land use impacts could be significant.

Potential impacts of Configuration 3B on recreation land use are similar to those described for Configuration 3A, except that up to 200,000 acre-feet of in-Delta storage would require converting from 14,000 to 15,000 acres of existing lands to storage. Impacts in the Delta Region under Configuration 3E would be similar to Configuration 3B. Recreation land use impacts under Configurations 3B and 3E could be significant.

Land use impacts of Configuration 3H would be similar to Configuration 2E, but with more agricultural land purchased for right-of-way for a conveyance canal than for a pipeline. Potential recreation land use impacts could be significant.

#### ***Recreational Opportunities***

The in-Delta storage components in Configurations 3B and 3I may provide additional recreational opportunities in the Delta Region. New storage in the Delta also may result in potentially significant impacts on existing recreation due to inundation or other related construction impacts.

Construction of an open-channel isolated conveyance facility on the east side of the Delta included in Configurations 3A, 3B, 3E, 3H and 3I likely would result in significant impacts on existing recreation resources. Although the size

of the conveyance facility would vary in each Configuration, size is not expected to vary the extent of impacts on recreation.

The open-channel isolated conveyance facility would be constructed in the vicinity of several existing recreation areas, including Stone Lakes NWR, fishing and boating access areas along several sloughs, and several trails and parks in San Joaquin County. Construction of the facility would temporarily disrupt existing facilities. Operation may result in closure of several existing facilities to allow for construction of the various pumps, siphons, access roads, storage buildings, and utilities. These impacts are considered potentially significant.

An enclosed pipeline would result in similar construction impacts as described for an isolated conveyance facility. Operation impacts may be less severe because most land uses could be returned to their original condition after construction. Impacts on recreation resources would vary depending on the location of the various facilities associated with the channel, such as pumps, siphons, access roads, storage buildings, and utilities.

### ***Fish, Wildlife & Recreation Economics***

Conveyance modifications in Configuration 3A, including a 5,000-cubic-foot-per-second (cfs) open channel and north-Delta and south-Delta modifications, would result in minor, if any, effects on recreation spending and user benefits in the Delta Region. Impacts would depend on access to the new facilities.

Under Configuration 3B, surface water storage facilities could be located in many locations, including on Sacramento River and San Joaquin River tributaries, off the aqueduct south of the Delta, and in the Delta. New reservoirs would generate increased spending at local establishments near new reservoirs and recreational benefits for users of reservoirs. In-Delta storage would provide minor, if any, new waterfowl hunting opportunities and

generate little, if any, new spending related to increased hunting. The conveyance modifications would be similar to those under Configuration 3A, resulting in similar minor effects on recreation spending and user benefits.

Under Configuration 3E, storage options are the same as those under Configuration 3B, resulting in minor, indirect increases in recreational spending and benefits in the Delta Region. The conveyance modifications, including north-Delta and south-Delta modifications and an isolated conveyance facility, would result in minor, if any, effects on recreation spending and user benefits.

Under Configuration 3H, storage modification would include surface water storage upstream of the Delta on Sacramento River and San Joaquin River tributaries and off the aqueduct south of the Delta, but these enhancements are not expected to affect recreation spending or user benefits in the Delta Region. The conveyance modifications, including modifications near Tyler Island, a floodway along the Mokelumne River, and south-Delta modifications, would result in a minor effect on recreation spending and user benefits because of new waterfowl hunting opportunities.

Under Configuration 3I, storage modification would include new in-Delta storage on Holland Tract, which could generate increased hunting recreation use, spending, and benefits in and near the Delta. Storage modifications also could include surface water storage upstream of the Delta on Sacramento River and San Joaquin River tributaries and off the aqueduct south of the Delta, but these enhancements are expected to result in minor, if any, effects on recreation spending and user benefits in the Delta Region. The conveyance modifications, including three isolated conveyance channels, new intakes, and south-Delta modifications, would result in a minor, if any, effect on recreation spending and user benefits.

Table 1 shows the predicted effect of Alternative 3 configurations on the economic

variables used to assess impacts on affected activities in the Delta Region. The direction and predicted magnitude of economic effects are indicated. Large, positive changes are predicted in spending and user benefits of sport fishing for anadromous fish and in other water-based recreation activities along rivers under Alternative 3 configurations.

### ***Social Well Being Related to Recreation***

Additional recreation jobs are expected to result from the habitat improvements and associated increased recreational use of the Delta. The increased recreational opportunities and potential for increased net employment opportunities is expected to result in a beneficial impact on social well being.

## **BAY REGION**

A summary of potential impacts on recreation facilities, opportunities, and use in the Bay Region for each alternative is shown in Table 11.

## **ALTERNATIVE 1**

### **Ecosystem Restoration Program**

#### ***Recreation Land Use***

Direct and construction-related recreation land use impacts associated with the Ecosystem Restoration Program are expected to be minor in the Bay Region.

#### ***Recreational Opportunities***

The Ecosystem Restoration Program includes several restoration actions in the Bay Region. In general, these actions are similar to those proposed for the Delta Region and are anticipated to result in similar impacts on recreation activities in the Bay Region. Until specific sites are identified, impacts on existing

specific recreation facilities cannot be identified.

### ***Fish, Wildlife & Recreation Economics***

Improved spawning, rearing, and survival conditions for sport species, as described for the Delta Region, should lead to increased populations of sport fish in the Bay Region. Larger populations could lead to increased recreational fishing, generating positive changes in recreational spending and benefits in the Bay Region.

CALFED actions could lead to larger ocean populations of chinook salmon originating from the Central Valley river system. It is difficult to assess the extent of the economic benefit to the commercial fishing industry. Ocean populations are comprised of salmon originating from various systems along the Pacific Coast, including Klamath and Snake River salmon whose populations are protected by catch restrictions. Because populations are intermingled, restrictions on the catch of Klamath and Snake River salmon can severely restrict the harvest of Central Valley chinook salmon. Assuming commercial and recreational salmon harvest restrictions are eased in the future for protected stocks, increases in populations of Central Valley chinook would lead to substantially increased salmon catch levels, spending, and net benefits.

The extent of the economic benefit to the recreational fishing industry in the Bay Region from improved conditions cannot be determined, as discussed for the Delta Region.

### **Water Quality Program and Coordinated Watershed Management**

Elements of the Water Quality Program could result in improved fishery, river recreation, and wildlife refuge conditions in the Bay Region. Improved water quality in the Bay should lead to healthier anadromous fish populations and

| Recreation Impact                                | Existing Conditions   | No Action  |   |
|--|---|--|---|
| <b>Recreation Facilities</b>                     |   |  |   |
| Temporary facility closure during construction   | No impact   | No impact  | Potentially significant impacts due to temporary closure during construction of habitat restoration projects. Mitigation: Provide like-kind facilities in the vicinity of displaced facilities or construct during the off-peak recreation season.  |
| Permanent closure of facilities                  | No impact   | No impact  | Construction for ERPP and Levee System Actions could result in permanent closure of existing facilities which is a potentially significant unavoidable adverse impact. Mitigation: Like-kind facilities should be developed in the vicinity of the displaced facilities.  |
| Development of new recreation facilities         |   |  | ERPP and Levee Program Actions could result in new recreation facilities which would result in a beneficial impact to recreation.   |
| <b>Recreation Opportunities</b>                  |   |  |   |
| Increased opportunities due to improved habitat  |   |  | Increased wildlife viewing, hiking, walking, and fishing opportunities expected due to ERPP actions resulting in a beneficial impact.   |
| Constraints on current practices (i.e., boating) |   |  | Potentially significant impact to boaters due to speed restrictions and discharge restrictions. Mitigation: None identified.  |
| Recreation Use                                   | Current recreation demand exceeds resources, especially for boating and fishing facilities. | Visitor use will increase with growing population, increasing demand for recreation resources and resulting in a potentially sign. impact on existing recreation resources | Visitor use anticipated to increase as a result of improved habitat, wildlife and water quality. This could be a beneficial impact or an adverse impact depending on the capacity of recreation resources. Mitigation: Additional recreation facilities should be developed to accommodate increased demand for recreation opportunities. |

**Table 11. Summary of Recreation Impacts in the Bay Region**

improved conditions for water-contact recreation in the Bay Region, resulting in increased spending and user benefits.

Potential restoration activities in the Bay Region's upper watershed areas could result in short-term impacts during construction and deconstruction. Vegetation and habitat restoration activities and channel improvements (such as bio-technical bank stabilization) in the upper watershed areas of the Bay Region could result in both positive (beneficial) and negative (adverse) impacts to recreation resources. For example, restoring freshwater marshes and tidal wetlands may create new recreational opportunities for hunters. To the extent that restoration actions result in increased visitation by birds and other wildlife, the effect on recreation would likely include expanded opportunities for wildlife viewing.

Restoration and channel improvement activities may result in some adverse impacts to recreation resources as a result of construction activities. During construction, recreation areas may be temporarily closed to the public and some recreation facilities, such as piers or marinas, could be temporarily or permanently closed. This could be considered a significant impact.

Potential road improvement would not adversely affect recreational opportunities, although road removals could limit access to recreation areas within the watershed.

### **Levee System Integrity Program**

Impacts from the Levee System Integrity Program are expected to be minor on all recreation resources in the Bay Region.

### **Water Use Efficiency Program and Water Transfers**

The Water Use Efficiency Program would result in minor or indirect impacts on all recreation resources in the Bay Region.

## **Storage and Conveyance**

### ***Recreation Land Use***

Water storage and conveyance facilities under Configuration 1C are not anticipated to substantially affect land uses in the Bay Region.

### ***Recreational Opportunities***

No storage or conveyance facilities are proposed in the Bay Region for any alternative. Under Configuration 1C, reservoir recreation could be enhanced by the development of surface water storage upstream of the Delta and off-aqueduct south of the Delta.

### ***Fish, Wildlife & Recreation Economics***

South-Delta modifications under Configurations 1A and 1B would not affect recreation spending or user benefits in the Bay Region. Storage enhancements under Configuration 1C are not likely to affect recreation spending or user benefits in the Bay Region.

Table 2 shows the predicted effects of Alternative 1 configurations on the economic variables used to assess impacts on affected activities in the Bay Region. As shown, sport fishing for anadromous fish is an important economic activity in the region. Sport fishing for anadromous fish is predicted to generate about \$23 million in annual spending by 2020. Moderate changes in these levels of spending and harvest value are predicted under Alternative 1 configurations.

## **ALTERNATIVE 2**

For Alternatives 2 and 3, impacts of the Ecosystem Restoration Program, Water Quality Program, Water Use Efficiency Program, Levee System Integrity Program, Water Transfers, and Coordinated Watershed Management on recreation resources would be similar to those described under Alternative 1.

## **Storage and Conveyance**

### ***Fish, Wildlife & Recreation Economics***

Conveyance modifications under Configuration 2A most likely would not affect recreation spending or user benefits in the Bay Region. Under Configuration 2B, storage modifications include new surface water and groundwater storage throughout the watershed, and conveyance modifications would be the same as Configuration 2A. These enhancements are not likely to affect recreation spending or user benefits in the Bay Region. Under Configuration 2E, modifications also are not likely to affect recreation spending or user benefits in the Bay Region.

Table 2 shows the predicted effect of Alternative 2 configurations on the economic variables used to assess impacts on affected activities in the Bay Region. Small to moderate positive changes are predicted in spending for, and user benefits, of sport fishing for anadromous fish under Alternative 2 configurations.

## **ALTERNATIVE 3**

### **Storage and Conveyance**

#### ***Fish, Wildlife & Recreation Economics***

Conveyance modifications in Configuration 3A, including north-Delta and south-Delta modifications, most likely would not affect recreation spending or user benefits in the Bay Region. Under Configuration 3B, surface water storage facilities on Sacramento River and San Joaquin River tributaries, off-aqueduct and south of the Delta, and in the Delta; and conveyance modifications would generate minor, if any, increases in spending in the Bay Region.

Enhancements under Configuration 3H are not expected to affect recreation spending and user benefits in the Delta Region. Conveyance

modifications, including modifications near Tyler Island, a floodway along the Mokelumne River, and south-Delta modifications, most likely would not affect recreation spending or user benefits in the Bay Region.

Under Configuration 3I, storage modifications would include new in-Delta storage on Holland Tract, which could generate increased hunting recreation use, spending, and benefits in the adjacent Bay Region. The conveyance modifications, including three isolated conveyance channels, new intakes, and south-Delta modifications, most likely would not affect recreation spending or user benefits.

Table 2 shows the predicted effect of Alternative 3 configurations on the economic variables used to assess impacts on affected activities in the Bay Region. Large, positive changes are predicted in spending on, and user benefits of, sport fishing for anadromous fish under Alternative 3 configurations.

## **SACRAMENTO RIVER REGION**

A summary of potential impacts on recreation facilities, opportunities, and use in the Sacramento River Region for each alternative is shown on Table 12.

## **ALTERNATIVE 1**

### **Ecosystem Restoration Program**

#### ***Recreation Land Use***

The Ecosystem Restoration Program involves some purchase and conversion of agricultural and potentially other land uses for habitat restoration in the Sacramento River Region. Configuration 1A components could involve converting or idling up to 34,000 acres of agricultural land, primarily on the east side and in the valley trough. Recreation land use impacts could be significant.

| Recreation Impact                                     |      | No Action  | 1A,<br>1B   | 1C, 2B, 2E, 3B, 3E, 3H, 3I  | 2A, 2D, 3A |
|---|------|--|---|---|------------|
| <b>Recreation Facilities</b>                          |      |  |   |   |            |
| <b>Temporary facility closure during construction</b> | None | No impacts   | Potentially significant adverse impacts due to temporary closure during construction of ERPP projects. Mitigation: Provide like-kind facilities during facility closure or restrict construction to off-peak recreation season.   |   |            |
|   |      |  |   | Potentially significant impacts during construction of surface storage and groundwater storage projects. Mitigation: Access to like kind facilities should be provided during temporary closures. For example, new facilities required for permanent closures should be developed prior to temporary closing of any facilities. |            |
| <b>Permanent closure of facilities</b>                | None | No impacts   | Potentially significant impacts due to construction for ERPP and Levee System Actions. Mitigation: Replace any displaced facilities with like kind facilities.  |   |            |
|   |      |  |   | Potentially significant impacts due to construction of surface storage and groundwater storage projects. Mitigation: New facilities should be developed prior to closing of any facilities to be replaced by surface storage or groundwater facilities.   |            |
| <b>Development of recreation facilities</b>           |      | No impacts   | ERPP and Levee Program Actions could result in new recreation facilities. This is a beneficial impact.  |   |            |
|   |      |  |   | New on-stream storage facilities could result in new recreation facilities. This is a beneficial impact.  |            |
| <b>Recreation opportunities</b>                       |      | Potential decrease or increase in recreation opportunities due to reoperation of Folsom Reservoir  | Increased wildlife viewing, hiking, walking, and fishing opportunities due to ERPP and Water Quality Program. Including Watershed Management Coordination actions. This is a beneficial impact.   |   |            |
| <b>Recreation use</b>                                 |      | Visitor use will increase with growing population, increasing demand for recreation resources and resulting in a potentially sign. impact on existing recreation resources | Visitor use anticipated to increase as a result of improved habitat, wildlife, and water quality. This is a potentially significant adverse impact if sufficient recreation resources are not available to support increased recreation use. Mitigation: Continue to develop recreation facilities to meet recreation demand. |   |            |

Table 12. Summary of Recreation Impacts in the Sacramento and San Joaquin River Regions

## ***Recreational Opportunities***

Most Ecosystem Restoration Program actions planned for the Sacramento River Region were developed to recover declining fish populations. Although it is difficult to predict impacts on recreation in the Sacramento River Region resulting from these actions, it seems probable that sport fishing opportunities would increase after fish populations recovered and reached target levels. Converting existing agricultural lands to riparian habitat also may increase recreational opportunities for sport fishing by providing additional area for shoreline access.

An additional impact on recreation could result from temperature changes of Nimbus Dam releases. Depending on the timing and extent of temperatures changes, if water was significantly cooler than current conditions, recreation use for activities such as swimming, tubing, canoeing, kayaking, and rafting could be affected.

## ***Fish, Wildlife & Recreation Economics***

Improved spawning, rearing, and survival conditions for sport species should lead to increased populations of sport fish in the Sacramento River Region. Larger populations could lead to increased recreational fishing, generating positive changes in recreational spending and benefits in the Sacramento River Region.

Although these actions could lead to larger ocean populations of chinook salmon originating from the Central Valley river system, the difficulty in assessing the extent of the economic benefits to the recreational fishing industry was discussed for the Delta Region.

Ocean populations comprise salmon originating from various systems along the Pacific Coast, including Klamath and Snake River salmon, whose populations are protected by catch restrictions. Because populations are intermingled, restrictions on the catch of Klamath and Snake River salmon can severely restrict the harvest of Central Valley chinook

salmon. Assuming that recreational salmon harvest restrictions were eased in the future for protected stocks, increases in ocean populations of Central Valley Chinook salmon would lead to substantially increased salmon catch levels, spending, and net benefits in the Sacramento River Region.

The Ecosystem Restoration Program would generate few, if any, economic benefits associated with water-based recreation activities along rivers and at reservoirs in the Sacramento River Region. Recreational use of wildlife refuges may increase if habitat was restored in existing wildlife refuges.

## ***Social Well Being Related to Recreation***

Impacts on social groups in the Sacramento River Region associated with implementing the Ecosystem Restoration Program would be similar to those discussed for the Delta Region.

## **Water Quality Program and Coordinated Watershed Management**

Elements of the Water Quality Program could result in improved fishery, river recreation, and wildlife refuge conditions throughout the Sacramento River Region, as discussed earlier for the Delta Region. The economic benefits to the recreation fishing industries of improved water quality are difficult to judge; however, improved water quality in rivers and the Delta should lead to healthier anadromous fish populations and improved conditions for water-contact recreation. The Water Quality Program would not likely affect recreational use of reservoirs in the Sacramento River Region.

Potential impacts of coordinated watershed management activities on recreation resources from vegetation and habitat restoration activities, as well as channel improvements, would generally be the same as those described above for the Bay Region. Road improvements would similarly not adversely affect recreation

resources in these areas, although road removals could limit access to recreation areas within the watershed.

### **Levee System Integrity Program**

The Levee System Integrity Program would result in minor or indirect impacts in the Sacramento River Region.

### **Water Use Efficiency Program and Water Transfers**

#### ***Fish, Wildlife & Recreation Economics***

The Water Use Efficiency Program could result in reduced opportunities for waterfowl hunting and wildlife viewing, and associated reductions in spending and net benefits from potential reductions in wetlands and riparian areas that depend on irrigation runoff and after-harvest field flooding. These adverse impacts on spending and net benefits are not expected to be significant.

Alternatively, the Water Use Efficiency Program could lead to reduced diversions, which would provide more water for instream purposes. This impact could provide greater opportunities for water-dependent recreation activities, both along affected rivers and at reservoirs. Recreation use at affected rivers and reservoirs, and associated spending and user benefits could increase.

### **Storage and Conveyance**

#### ***Recreation Land Use***

Impacts on recreation land use associated with water storage and conveyance features are described at length for the Delta Region.

Developing 250 thousand acre-feet (TAF) of groundwater storage in the Sacramento River Region is not anticipated to result in significant impacts on recreation. The physical development of a groundwater storage facility

generally is limited to developing several injection wells, which typically are compatible with most land uses, including recreation. Additionally, a conveyance facility of some type would need to be constructed to convey water from the source to the point of injection. Impacts related to the conveyance facility likely would be associated only with construction and would be temporary. The diversion of 250 TAF of water likely would occur during winter storm flows and therefore would not affect minimum recreation flows required during peak recreations months in the spring, summer, and fall.

#### ***Fish, Wildlife & Recreation Economics***

South-Delta modifications under Configurations 1A and 1B would result in a minor, if any, effect on recreation spending and user benefits in the Sacramento River Region.

Under Configuration 1C, reservoir recreation could be enhanced by developing surface water storage upstream of the Delta. These storage enhancements would result in increased recreation spending and user benefits in the Sacramento River Region associated with new boating, swimming, and fishing opportunities.

Table 3 shows the predicted effect of Alternative 1 configurations on the economic variables used to assess impacts on affected activities in the Sacramento River Region. As shown, sport fishing for anadromous fish and water-based recreation activities at reservoirs result in major economic impacts in the region, with \$125 million in annual spending predicted by 2020. Moderate, positive changes in these levels of spending and user benefits are predicted under Alternative 1 configurations.

### **ALTERNATIVE 2**

Impacts of the Ecosystem Restoration Program; Water Quality Program, Water Use Efficiency Program, Levee System Integrity Program, Water Transfers, and Coordinated Watershed Management on all recreation resources under

all configurations of Alternatives 2 and 3 in the Sacramento River Region would be similar to those described for Alternative 1.

## **Storage and Conveyance**

### ***Fish, Wildlife & Recreation Economics***

Conveyance modifications under Configuration 2A would result in a minor, if any, effect on recreation spending and user benefits in the Sacramento River Region. Under Configuration 2B, reservoir recreation could be enhanced by developing surface water storage upstream of the Delta on the Sacramento River. Impacts of this new storage on recreation spending and user benefits would be similar to those described for Configuration 1C. The impact of conveyance modifications under Configuration 2A would be the same as those described for Configuration 2A. Overall, recreation spending and user benefits in the Sacramento River Region would be moderately affected by these enhancements.

Under Configuration 2E, storage modifications would include surface water storage upstream of the Delta on Sacramento River tributaries. These enhancements are expected to moderately affect recreation spending and user benefits associated with reservoir activities in the Sacramento River Region.

Table 3 shows the predicted effect of Alternative 2 configurations on the economic variables used to assess impacts on affected activities in the Sacramento River Region. Small to moderate positive changes are predicted in spending on, and user benefits of, sport fishing for anadromous fish; and moderate to large changes are predicted in spending on, and user benefits of, water-based activities at reservoirs under Alternative 2 configurations.

### ***Social Well Being Related to Recreation***

Configurations 2B and 2E could result in significant negative or positive impacts on recreationists and recreation workers, depending

on the location, configuration, and operation of new facilities. If new storage facilities inundated existing facilities without relocating or replacing them in-kind, adverse impacts would result. If new facilities provided improved recreation facilities and additional facilities, additional jobs would be provided for recreation workers and additional recreational opportunities would become available to recreationists.

## **ALTERNATIVE 3**

### **Storage and Conveyance**

#### ***Fish, Wildlife & Recreation Economics***

Conveyance modifications under Configuration 3A, including north-Delta and south-Delta modifications, would result in minor, if any, effects on recreation spending and user benefits in the Sacramento River Region. Under Configurations 3B and 3E, surface water storage facilities located on the Sacramento River would generate large increases in spending and user benefits in the region.

Under Configuration 3H, storage modification would include surface water storage upstream of the Delta on the Sacramento River. These enhancements could be expected to substantially affect recreation spending and user benefits in the Sacramento River Region. Conveyance modifications most likely would not affect recreation spending and benefits. Under Configuration 3I, storage modifications would include new in-Delta storage on Holland Tract, which could generate minor increases in recreation spending and benefits in the adjacent Sacramento River Region. Conveyance modifications would not affect recreation spending or user benefits.

Table 3 shows the predicted effect of Alternative 3 configurations on the economic variables used to assess impacts on affected activities in the Sacramento River Region. Large positive changes are predicted in

spending on, and user benefits of, sport fishing for anadromous fish; and moderate positive changes are predicted for spending on, and user benefits of, water-based activities at reservoirs under Alternative 3 configurations.

### ***Social Well Being Related to Recreation***

Impacts associated with Configurations 3B, 3E, 3H, and 3I would be the same as those described for Alternative 2

## **SAN JOAQUIN RIVER REGION**

A summary of potential impacts on recreation facilities, opportunities and use in the San Joaquin River Region for each alternative is shown on Table 12.

### **ALTERNATIVE 1**

#### **Ecosystem Restoration Program**

##### ***Recreation Land Use***

The Ecosystem Restoration Program includes some purchase and conversion of agricultural and potentially other land uses for habitat restoration in the San Joaquin River Region. The total effect of Configuration 1A components could be the conversion or idling of up to 11,000 acres of agricultural land, primarily lands east of the San Joaquin River, and could result in potentially significant recreation land use impacts.

##### ***Recreational Opportunities***

In general, impacts associated with implementing Ecosystem Restoration Program actions in the San Joaquin River Region would be similar to those anticipated in the Delta, Bay, and Sacramento River regions. Actions planned to improve fish habitat and install fish screens should result in improved fishery populations, resulting in increased fishing opportunities.

Restoration and creation of riparian habitat, aquatic habitat, and wetland habitat should provide increased opportunities for shoreline fishing, hunting, and wildlife viewing.

### ***Fish, Wildlife & Recreation Economics***

Improved survival conditions for sport species associated with implementing the Ecosystem Restoration Program are the same as those described for the Delta, Bay, and Sacramento River regions. Larger populations could lead to increased recreational fishing, generating positive changes in recreational spending and benefits in the San Joaquin River Region.

The Ecosystem Restoration Program would generate few, if any, economic benefits associated with water-based recreation activities along rivers and at reservoirs in the San Joaquin River Region. Recreational use of wildlife refuges in the region may increase if habitat was restored in existing wildlife refuges.

#### **Water Quality Program and Coordinated Watershed Management**

##### ***Recreational Opportunities***

Anticipated positive impacts of the Water Quality Program on recreation in the San Joaquin River Region would be similar to those described for the Delta Region.

### ***Fish, Wildlife & Recreation Economics***

Elements of the Water Quality Program could result in improved fishery, river recreation, and wildlife refuge conditions throughout the San Joaquin River Region. Economic benefits to the recreation salmon fishing industries of improved water quality are difficult to judge; however, improved water quality in rivers and the Delta should lead to healthier anadromous fish populations and improved conditions for water-contact recreation. The Water Quality

Program likely would not affect recreational use of reservoirs.

### **Levee System Integrity Program**

The Levee System Integrity Program would result in minor or indirect impacts in the San Joaquin River Region.

### **Water Use Efficiency Program and Water Transfers**

#### ***Fish, Wildlife & Recreation Economics***

The Water Use Efficiency Program could result in reduced opportunities for waterfowl hunting and wildlife viewing, and associated reductions in spending and net benefits from potential reductions in wetlands and riparian areas that depend on irrigation runoff and after-harvest field flooding. These adverse impacts on spending and net benefits are not expected to be significant.

Alternatively, the Water Use Efficiency Program could lead to reduced diversions, which would provide more water for instream purposes. This impact could provide greater opportunities for water-dependent recreation activities, both along affected rivers and at reservoirs. Recreation use at affected rivers and reservoirs, and associated spending and net benefits could increase.

### **Storage and Conveyance**

#### ***Recreation Land Use***

Some land uses could be affected by the location of water storage and conveyance facilities under Configuration 1C. Existing land uses at the location of large storage facilities are likely to be agricultural or open space. Conversion of these land uses is considered a potentially significant impact.

### ***Recreational Opportunities***

Configuration 1C includes new storage to provide opportunities for enhanced timing and flow management in order to more effectively and efficiently satisfy urban, agricultural, and environmental beneficial users.

In the San Joaquin River Region, Configuration 1C includes 500,000 TAF of groundwater storage. Potential impacts on recreation associated with developing groundwater storage are described for the Sacramento River Region.

No conveyance facilities are proposed in the San Joaquin River Region in Alternative 1.

#### ***Fish, Wildlife & Recreation Economics***

South-Delta modifications under Configurations 1A and 1B would result in a minor, if any, effect on recreation spending and user benefits in the San Joaquin River Region.

Under Configuration 1C, reservoir recreation could be enhanced by developing surface water storage off the aqueduct south of the Delta, which would moderately affect recreation spending and user benefits in the San Joaquin River Region.

Table 4 shows the predicted effect of Alternative 1 configurations on the economic variables used to assess impacts on affected activities in the San Joaquin River Region. As shown, water-based recreation activities at rivers and reservoirs result in major economic impacts in the region, with \$95 million in annual spending predicted by 2020. Small to moderate positive changes are predicted in spending and user benefits of water-based river recreation, and moderate to large positive changes are predicted for reservoir recreation under Alternative 1 configurations.

## **ALTERNATIVE 2**

For Alternatives 2 and 3, impacts of the Ecosystem Restoration Program; Water Quality Program, Including Watershed Management Coordination; Levee System Integrity Program; and Water Use Efficiency Program, Including Water Transfers on all recreation resources would be similar to those described for Alternative 1.

### **Storage and Conveyance**

Alternatives 2 and 3 include surface water storage facilities and groundwater storage in San Joaquin County. Impacts on recreation land use and recreation associated with these types of facilities are described for the Sacramento River Region.

### ***Fish, Wildlife & Recreation Economics***

Under Configuration 2A, conveyance modifications would result in a minor, if any, effect on recreation spending and user benefits in the San Joaquin River Region.

Under Configuration 2B, reservoir recreation could be enhanced by developing surface water storage on the San Joaquin River tributaries and south of the Delta off the aqueduct. The conveyance modifications would be the same as those under Configuration 2A. The overall effect of these enhancements is that recreation spending and user benefits in the San Joaquin River Region would be substantially affected.

Under Configuration 2E, storage modifications would include surface water storage off the aqueduct and south of the Delta. These enhancements, combined with conveyance modifications along the Mokelumne River and south Delta, would result in a minor increase in recreation spending and user benefits in the San Joaquin River Region.

Table 4 shows the predicted effect of Alternative 2 configurations on the economic

variables used to assess impacts on affected activities in the San Joaquin River Region. Small to moderate positive changes are predicted in spending on, and user benefits of, water-based river recreation and moderate to large positive changes are predicted for reservoir recreation under Alternative 2 configurations.

### ***Social Well Being Related to Recreation***

Configurations 2B and 2E could result in significant negative or positive impacts on recreationists and recreation workers depending on the location, configuration and operation of new facilities. If new storage facilities inundate existing facilities without relocating or replacing them in-kind, adverse impacts would result. However, if new facilities provide improved recreation facilities and additional facilities over the existing condition, then additional jobs would be provided for recreation workers and additional recreational opportunities would become available to recreationists.

## **ALTERNATIVE 3**

### **Storage and Conveyance**

Alternative 3 includes both surface water storage facilities and groundwater storage in San Joaquin County. Impacts on recreation land use and recreation associated with these types of facilities are described for the Sacramento River Region.

### ***Fish, Wildlife & Recreation Economics***

Conveyance modifications under Configuration 3A, including north-Delta and south-Delta modifications, would result in minor, if any, effects on recreation spending and user benefits in the San Joaquin River Region.

Under Configurations 3B and 3E, surface water storage facilities located on tributaries to the San Joaquin River and off the aqueduct south of

the Delta would generate substantial increases in spending and user benefits in the San Joaquin River Region.

Under Configuration 3H, storage modifications would include surface water storage on San Joaquin tributaries and off the aqueduct and south of the Delta. These enhancements could be expected to substantially affect recreation spending and user benefits in the San Joaquin River Region. The conveyance modifications most likely would not affect recreation spending and benefits.

Under Configuration 3I, storage modifications would include new in-Delta storage on Holland Tract, which could generate increased hunting use, spending, and benefits in the adjacent San Joaquin River Region. Conveyance modifications most likely would not affect recreation spending or user benefits.

Table 4 shows the predicted effect of Alternative 3 configurations on the economic variables used to assess impacts on affected activities in the San Joaquin River Region. Moderate, positive changes are predicted in spending on, and user benefits, of water-based river recreation; and large, positive changes are predicted for reservoir recreation under Alternative 3 configurations.

### ***Social Well Being Related to Recreation***

Configurations 3B, 3E, 3H, and 3I could result in a significant negative or positive impacts on recreationists and recreation workers depending on the location, configuration and operation of new facilities.

If new storage facilities inundated existing facilities without relocating or replacing them in-kind, adverse impacts would result. If new facilities provided improved recreation facilities and additional facilities over the existing condition, additional jobs would be provided for recreation workers and additional recreational opportunities would become available to recreationists.

## **SWP AND CVP SERVICE AREAS OUTSIDE THE CENTRAL VALLEY**

A summary of potential impacts on recreation facilities, opportunities, and use in the SWP and CVP Service Areas Outside the Central Valley for each alternative is shown in Table 9.

### **ALTERNATIVE 1**

#### **Ecosystem Restoration Program**

No Ecosystem Restoration Program actions are planned for the SWP and CVP Services Areas outside the Central Valley. The program would result in minor or indirect impacts on recreation resources in the region.

#### **Water Quality Program and Coordinated Watershed Management**

Implementation of the Water Quality Program should result in a positive impact on recreation resources in the SWP and CVP Service Areas Outside the Central Valley. Improving the quality of water flowing into and through the Delta would result in higher quality water in aqueducts and at terminal reservoirs throughout the SWP and CVP projects. This improvement would enhance the recreation experience and minimize risks that previously may have existed from body contact in these waterbodies.

#### ***Fish, Wildlife & Recreation Economics***

Economic benefits of improved water quality are higher quality recreational opportunities, resulting in greater spending and increased user benefits at reservoirs in the SWP and CVP Service Areas.

## **Water Use Efficiency Program and Water Transfers**

### ***Fish, Wildlife & Recreation Economics***

The Water Use Efficiency Program is expected to result in reoperation of reservoirs, which would change the availability of water to support recreation activities. It is expected that implementing more stringent conservation measures would help conserve existing supplies to meet a greater future demand. This action could reduce the flexibility to delay drawdown of reservoirs and could negatively affect opportunities for reservoir recreation. This impact, which is not expected to be significant, could reduce spending and user benefits at reservoirs in the SWP and CVP Service Areas.

### **Storage and Conveyance**

#### ***Recreation Land Use***

Water storage and conveyance facilities under Configuration 1C are not anticipated to significantly affect recreation land uses in the SWP and CVP Service Areas Outside the Central Valley.

#### ***Recreational Opportunities***

No storage facilities are proposed in the SWP and CVP Service Areas Outside the Central Valley; however, storage facilities upstream may affect recreation facilities in the region if overall system operation resulted in additional water provided to the CVP and SWP system, which would result in a positive impact on recreation resources.

### ***Fish, Wildlife & Recreation Economics***

Under Configurations 1A and 1B, south-Delta modifications most likely would not affect recreation spending and user benefits in the SWP and CVP Service Areas Outside the Central Valley. Under Configuration 1C, water deliveries would be increased, resulting in

improved conditions for reservoir recreation and associated increases in recreation spending and user benefits.

Table 5 shows the predicted effect of Alternative 1 configurations on the economic variables used to assess impacts on affected activities in the SWP and CVP Service Areas Outside the Central Valley. As shown, water-based recreation activities at reservoirs result in major economic impacts in the region, with \$193 million in annual spending predicted by 2020. Small, negative changes are predicted in spending and user benefits associated with water-based reservoir recreation under Configuration 1A; and small, positive changes are predicted for reservoir recreation under Configurations 1B and 1C.

### **ALTERNATIVE 2**

Impacts on recreation land use and recreation under Alternatives 2 and 3 would be similar to Alternative 1.

### ***Fish, Wildlife & Recreation Economics***

Under configurations of Alternatives 2 and 3, water deliveries to urban areas would be increased, resulting in improved conditions for reservoir recreation and associated increases in recreation spending and user benefits.

Table 5 shows the predicted effect of configurations of Alternatives 2 and 3 on the economic variables used to assess impacts on affected activities in the SWP and CVP Service Areas. Moderate, positive changes are predicted in spending and user benefits associated with reservoir recreation under Alternative 2 configurations.

### **ALTERNATIVE 3**

### **Storage and Conveyance**

In Alternative 3, water quality delivered is expected to be greatly improved because of

operations of the isolated facilities. This is expected to result in beneficial impacts on water-based recreational opportunities at receiving reservoirs and canals.

## **MITIGATION STRATEGIES**

Mitigations are proposed as strategies in this programmatic document and are conceptual in nature. Final mitigations would need to be approved by responsible agencies as specific projects are approved by subsequent environmental review.

### **Recreation Land Use**

The following measures could be implemented to mitigate potentially significant recreation land use impacts identified for all alternatives.

To the extent practicable, CALFED program actions should be selected that are consistent with local and regional land use plans. Local jurisdictions affected by CALFED actions should be consulted with early in the Phase III planning and environmental review process.

Implementation of this strategy would have no foreseeable adverse land use impacts; impacts may remain potentially significant after mitigation.

### **Recreational Opportunities**

A comprehensive recreation planning program would be developed concurrently with developing detailed restoration and storage and conveyance projects. Comprehensive planning would include an overall assessment of existing recreation deficits and projected modifications due to the Ecosystem Restoration Program and other CALFED programs. This planning effort

would result in proposed recreation projects which, when implemented, would act as mitigation for impacts on recreation resulting from habitat restoration activities.

This recreation program would address existing deficiencies in recreation, particularly in the Delta, as well as provide for appropriate modifications and additions to recreation facilities that may be required to accommodate other CALFED projects. For example, comprehensive recreation planning, coordinated with habitat restoration projects and storage and conveyance projects, would serve to mitigate potential impacts on boating circulation. Displaced boats due to wakeless speed zones would need to be re-routed to different waterways to ensure adequate boating traffic circulation between different areas of the Delta. Identification of appropriate detours would be accomplished during the development of the comprehensive plan for recreation. Mitigation for modifications to existing circulation that would result from south Delta fish control barriers would require development of alternative routes without exacerbating congestion in surrounding waterways.

The goal of the recreation program is to avoid impacts from CALFED projects and improve recreational opportunities.

In addition to developing the recreation program, the following mitigation measures could be implemented, at a minimum, to minimize impacts on existing recreation use:

- Construction required for Ecosystem Restoration and Levee System Integrity programs that could affect nearby recreation should not be conducted during the peak recreation season (May to September), to the extent possible.
- New and equitable facilities should be provided when existing facilities are temporarily or permanently eliminated.

- Fluctuation of water levels of existing and new reservoirs should be minimized.
- If boating circulation in the Delta was modified due to temporary, seasonal, or permanent channel closures, a comprehensive analysis of boating circulation should be conducted to ensure that appropriate alternative routes are identified and clearly marked.
- To the extent possible, the restoration and redesign of existing levees and the design of new levees should accommodate vehicular access and parking for shoreline fishing, boat launching, swimming, hiking, bicycling, and wildlife viewing. Also, if levee projects are designed to provide access to waterfront parcels of useable land on island edges, then opportunities for day use boating and camping can be created.

Construction of modifications to conveyance facilities under Configurations 1B and 1C may temporarily restrict recreation activities including boating, fishing, hunting and wildlife viewing in the vicinity of the construction area. To mitigate this potentially significant impact, construction should be scheduled to minimize conflict with the peak recreation season (May to September).

### ***Social Well Being Related to Recreation***

Because the major impact on social well being is the loss of jobs, mitigation strategies for lost jobs should include the following:

- Minimize the number of lost jobs to the extent possible by relocating facilities.
- Provide training and educational opportunities for unemployed individuals to reenter the workforce in a different field.

Refer to the Regional Economics Environmental Consequences Technical Report for additional discussion concerning lost jobs.

### **POTENTIALLY SIGNIFICANT UNAVOIDABLE IMPACTS**

No potentially significant unavoidable impacts were identified.

### **REFERENCES - ENVIRONMENTAL CONSEQUENCES**

- California Department of Conservation. 1994. Farmland Conversion Report 1992 to 1994. (Table 2.) Sacramento, CA.
- California Department of Water Resources. 1994. California Water Plan Update. Sacramento, CA.
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