

**CENTRAL VALLEY PROJECT IMPROVEMENT ACT  
PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT**

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**DRAFT TECHNICAL APPENDIX**

**Fish, Wildlife, and Recreation Economics**

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**September 1997**

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## LIST OF ABBREVIATIONS AND ACRONYMS

Bay-Delta	San Francisco Bay/Sacramento-San Joaquin Delta
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
DFG	California Department of Fish and Game
NMFS	National Marine Fisheries Service
NWRs	national wildlife refuges
PEIS	Programmatic Environmental Impact Statement
PFMC	Pacific Fishery Management Council
Service	U.S. Fish and Wildlife Service
SWP	State Water Project

**CHAPTER I**

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**INTRODUCTION**

# Chapter I

## INTRODUCTION

The Draft Programmatic Environmental Impact Statement (PEIS) summarizes the evaluation of the direct and indirect impacts of implementing a wide range of actions identified in the Central Valley Project Improvement Act (CVPIA). Details of the information used in the definition of the affected environment and analysis of the environmental consequences are presented in the technical appendices of the Draft PEIS.

This technical appendix presents a summary of economic recreational benefits at key recreation areas, including background information that was used during the PEIS preparation, and the results of the impact analyses for conditions that occurred throughout the study area, shown in Figure I-1.

The recreational economics analysis was primarily based upon changes in recreational opportunities and associated recreational benefits from existing data sources. Information from the Recreation Technical Appendix was used in the fish, wildlife, and recreation economics analyses. This technical appendix also includes an attachment that discusses economics of coastal fishing communities with commercial salmon fishing fleets and the effects of changes in the salmon harvest.

Information from this technical appendix was used in the Regional Economics Technical Appendix.

The assumptions and results of the analyses for Alternatives 1, 2, 3, and 4 are presented in this technical appendix and summarized in the Draft PEIS. The assumptions and results of the Supplemental Analyses 1a through 1i, 2a through 2d, 3a, and 4a are summarized only in the Draft PEIS. The assumptions related to the fish, wildlife, and recreation economics analyses for Alternatives 1, 2, 3, and 4 are presented in Table I-1. The results of the analyses are presented in Table I-2.



**FIGURE I-1  
STUDY AREA**

TABLE I-1

**SUMMARY OF ASSUMPTIONS FOR FISH, WILDLIFE,  
AND RECREATION ECONOMICS ANALYSES**

Alternative or Supplemental Analysis	Assumption
No-Action Alternative	Use existing relationships between expenditures and benefits and recreational uses.
1	Same as No-Action Alternative.
2	Same as No-Action Alternative.
3	Same as No-Action Alternative.
4	Same as No-Action Alternative.

TABLE I-2

**SUMMARY OF IMPACT ASSESSMENT OF  
FISH, WILDLIFE, AND RECREATION ECONOMICS**

Affected Factors	No-Action Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	<i>Percent Change from No-Action Alternative</i>				
<b>Recreation-Related Benefits</b>					
Sacramento River Region	\$211,212,000	<1	<1	<1	<1
San Joaquin River Region	\$56,057,000	<1	2	3	3
Tulare Lake Region	\$79,000	0	150	150	150

**CHAPTER II**

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**AFFECTED ENVIRONMENT**

## Chapter II

### AFFECTED ENVIRONMENT

#### INTRODUCTION

The Fish, Wildlife, and Recreation Economics Technical Appendix focuses on four of the PEIS study area regions: the Sacramento River, San Francisco Bay/Sacramento-San Joaquin Delta (Bay-Delta), San Joaquin River, and Tulare Lake regions, as well as on the Pacific Coast Region, depicted in Figure II-1. The Pacific Coast Region extends along the California coast from the California/Oregon border to Monterey, California. The Pacific Coast Region is divided for purposes of this analysis into three subregions: North Coast, San Francisco, and Central Coast. Key ports in these subregions are shown in Figure II-1. The PEIS South Coast Region is not evaluated in this technical appendix because the CVPIA alternatives are not expected to affect fisheries, wildlife, or recreation in that region.

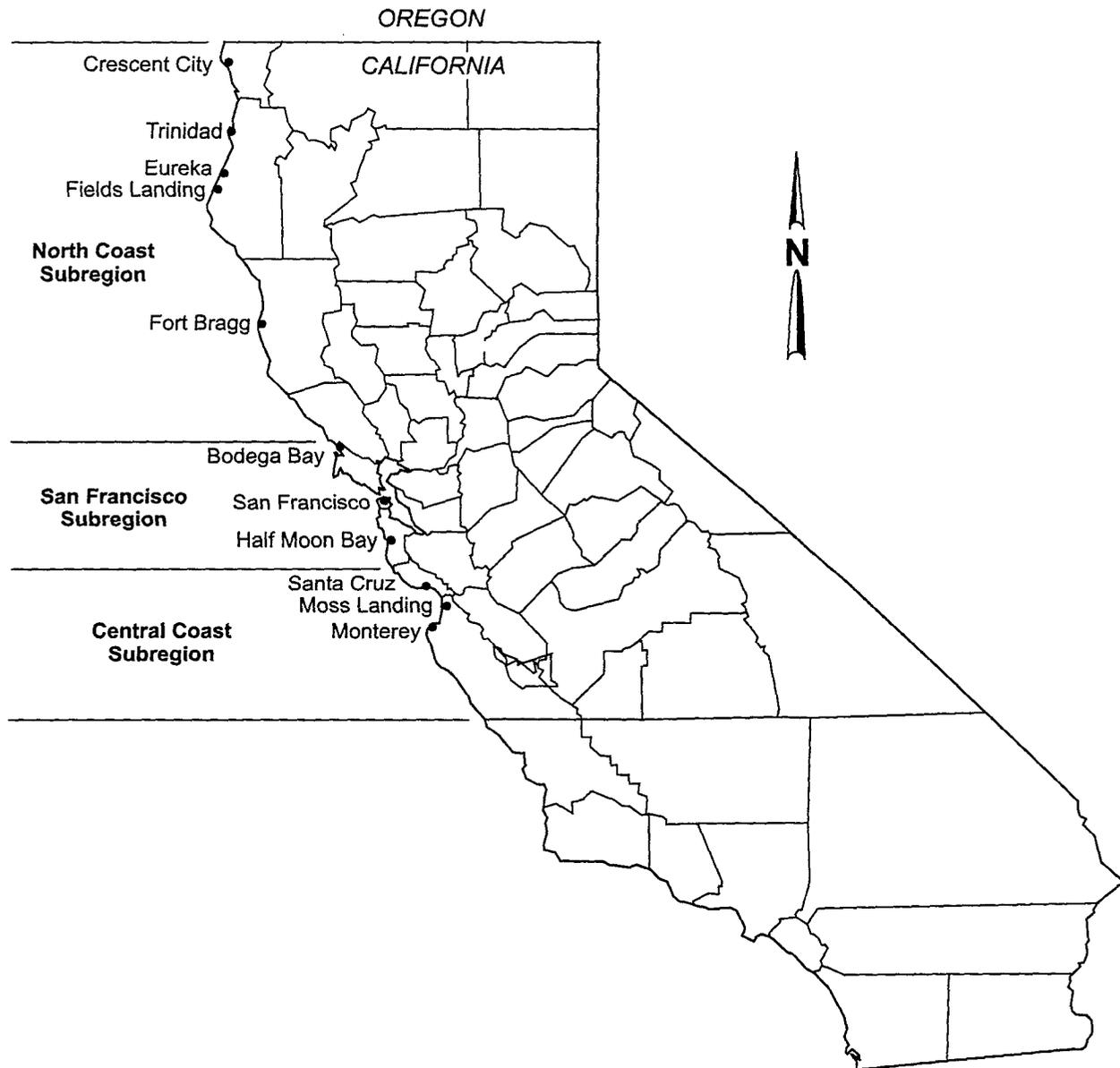
This technical appendix describes economic conditions pertaining to recreation activities at lakes and reservoirs, streams and rivers, and wildlife refuges in the Sacramento River, San Joaquin River, and Tulare Lake regions (including water-dependent activities such as boating, fishing, rafting, swimming, hunting, and wildlife observation) that could be affected by implementation of the CVPIA.

An economic evaluation of sport fishing for anadromous species (e.g., salmon, steelhead, striped bass, and sturgeon) in the Bay-Delta, Sacramento River, and Pacific Coast regions and of commercial fishing in the Pacific Coast Region is provided in Attachment A, "Effects of Improvements in Anadromous Fisheries". This evaluation is based on different harvest scenarios and assumptions that are not correlated with the CVPIA alternatives.

Within this chapter, recreation trip-related expenditures were estimated for major reservoirs, rivers and streams, and wildlife refuges that could be affected by implementation of the CVPIA. The major reservoirs for this analysis are Shasta Lake, Folsom Lake, Lake Oroville, San Luis Reservoir, Millerton Lake, New Melones Reservoir, Lake McClure, New Don Pedro Reservoir, New Hogan Lake, and Camanche Reservoir. Major rivers and streams for this analysis are the Sacramento, Feather, American, Yuba, San Joaquin, Merced, Tuolumne, and Stanislaus rivers. Trip-related expenditures for all other recreation areas described in the Recreation Technical Appendix were not included in this regional analysis because operations are not expected to affect use at these recreation areas.

#### DATA SOURCES

Information on area-specific levels of recreation use from the Recreation Technical Appendix was used to estimate trip-related spending on recreation and net recreation benefits.



**FIGURE II-1**  
**PACIFIC COAST REGION**

Information from surveys conducted by the U.S. Fish and Wildlife Service (Service) and National Marine Fisheries Service (NMFS) was used to develop trip-related spending profiles for recreation users.

Information on recreation benefits was obtained from existing economic studies on key recreation areas that may be affected by the CVPIA. Data also were obtained from economic studies on recreation areas outside the study area to characterize potential recreation benefits to users of the key recreation areas.

As presented in the Recreation Technical Appendix, the following assumptions were used to convert recreation use levels to visitor days in the analysis:

- At all reservoirs, 12 recreation visitor hours are considered, on average, equal to 1 visitor day.
- At all river recreation areas, six visitor hours are considered on average equal to one visitor day.
- At all other areas, one visit is considered on average equal to one visitor day.

All trip-related spending by local residents was assumed to occur in the regional economic area being visited, and 80 percent of trip-related spending by nonresidents was assumed to occur in the regional economic area.

## **HISTORICAL PERSPECTIVE**

This section describes economic trends pertaining to sport fishing and commercial fishing activities between 1970 and 1990. Because data are not available for some years during this period, information for some activities is presented for a more limited period. Because this section is intended to provide a description of trends, some data contained in this section are described in five-year periods.

### **SPORT FISHING**

#### **Ocean Salmon Sport Fishing**

Data for the 20-year period between 1971 and 1990 have been aggregated into four five-year periods. Salmon sport fishing off the California coast declined on average, by 14 percent during the 1981-1985 period compared to the 1976-1980 period (Figure II-2). These declines were shared approximately equally between charter boat fishing and private boat fishing. Ocean salmon sport fishing activity increased during the 1986-1990 period, roughly meeting the 1971-1975 average level of effort.

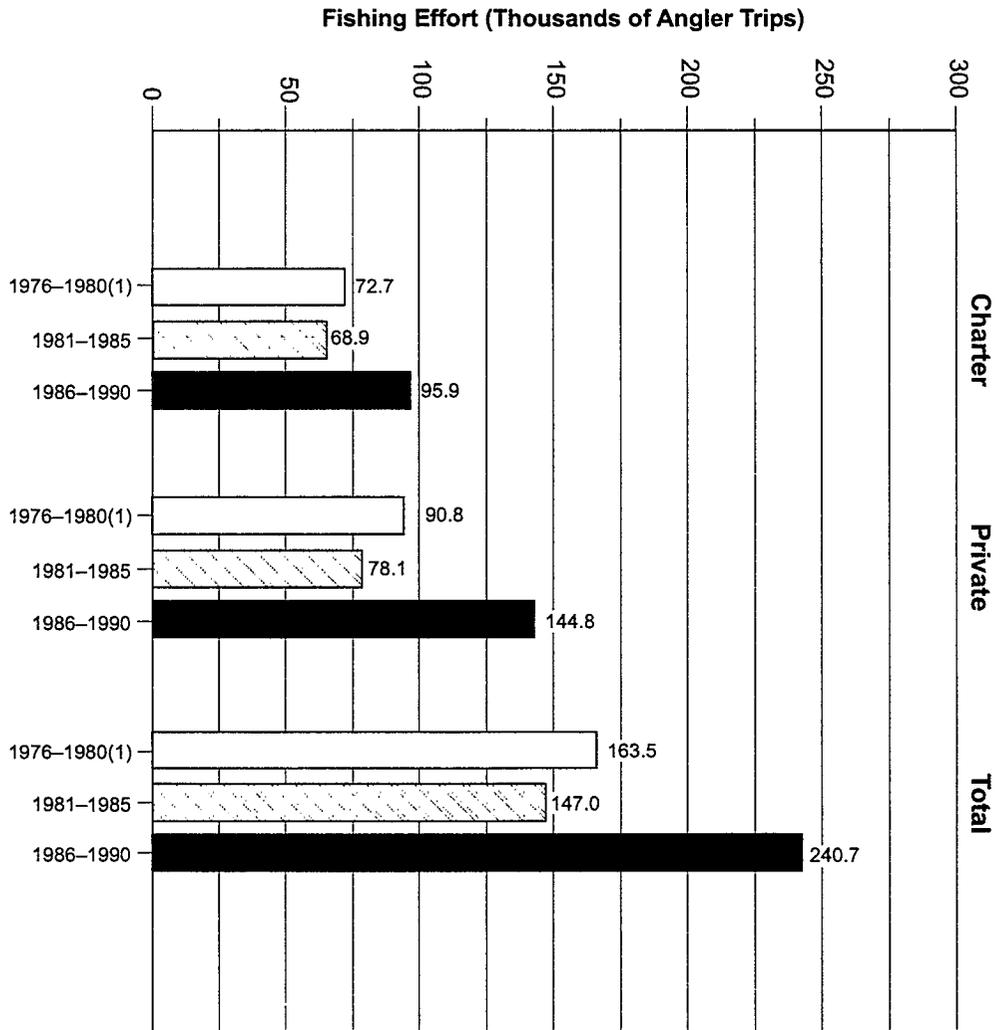


FIGURE II-2

HISTORICAL TRENDS IN AVERAGE ANNUAL OCEAN SALMON SPORT FISHING EFFORT IN THE PACIFIC COAST REGION BY VESSEL TYPE

NOTE:  
 No information available for 1971-1975.  
 (1) = Data available for 1979 and 1980 only.

SOURCE:  
 PFM/C, 1993a.

Historical trends in personal income attributable to California offshore salmon sport fishing paralleled trends in fishing effort (Table II-1). Personal income estimates include all direct, indirect, and induced income (wages, salaries, and profits) that is attributable to salmon sport fishing in the processing and harvesting sectors. Income attributable to salmon fishing increased for the 1986-1990 period in all ports from Crescent City to Monterey after generally declining during the previous five-year period.

TABLE II-1

**AVERAGE ANNUAL PERSONAL INCOME ATTRIBUTABLE TO  
OCEAN SALMON SPORT FISHING IN  
THE PACIFIC COAST REGION BY MAJOR PORTS**

Period	Crescent City	Eureka	Fort Bragg	San Francisco	Monterey	Subtotal
1976-1980	907	1,052	613	9,207	504	12,283
1981-1985	994	1,024	491	8,154	651	11,314
1986-1990	1,684	1,755	856	9,906	2,678	16,879

NOTES:  
 Amounts shown are in thousands of 1992 dollars.  
 Data on income are not available before 1976.  
 Personal income estimates include all wages, salaries, and profits attributable to salmon sport fishing.

SOURCES:  
 PFMC, 1993b; Seger, pers. comm.

### Freshwater Sport Fishing

The San Francisco Bay estuary (including San Francisco, San Pablo, and Suisun bays and the Sacramento-San Joaquin River Delta) supports the principal sport fisheries for salmon and striped bass in California. The Sacramento River and its tributaries are among the state's most important freshwater sport fisheries for salmon, striped bass, steelhead trout, resident trout, American shad, sturgeon, and catfish.

Freshwater salmon and steelhead sport fishing increased in California by 13 percent between 1980 and 1985 (Table II-2). Over the same period, striped bass fishing increased by 80 percent and trout fishing declined by 7 percent. Because of changes in survey methods, data for sport fishing after 1985 are not comparable to the data for 1980 and 1985 and are therefore not presented.

Subsequent declines in economic activity associated with potentially affected sport fisheries are indicated by historical trends in the passenger vessel fleet operating in the San Francisco Bay estuary and in the numbers of fishing guides operating on the Sacramento River. Approximately 35 charter vessels were in operation in 1970, compared to approximately 10 vessels in 1993 (Fraser, pers. comm.). Between 1980 and 1993, the number of full-time guides operating on the Sacramento River declined from more than 100 to only 2 (Meyer, pers. comm.). Meanwhile, the

Sacramento River declined from more than 100 to only 2 (Meyer, pers. comm.). Meanwhile, the level of effort required for guided anglers to catch fish increased substantially. For example, one guide's clients could catch limits of three salmon in an average of two hours in 1970, as compared to 8 to 10 hours typically needed to catch a one-salmon limit in 1993 (Meyer, pers. comm.).

TABLE II-2

**FRESHWATER SPORT FISHING EFFORT AND TRIP-RELATED EXPENDITURES  
IN CALIFORNIA FOR SELECTED YEARS BY SPECIES SOUGHT**

Species Sought	Effort (thousands of angler days)		Expenditures (millions of 1992 dollars)	
	1980	1985	1980	1985
All freshwater species	43,653	43,888	1,188.5	1,315.0
Salmon and steelhead (1)	4,757	5,382	130.0	161.2
Striped bass (1)	5,588	10,076	152.0	301.9
Trout (1)	24,468	22,821	666.2	683.8

NOTE:  
(1) Expenditures are based on the average expenditures per level of effort for all freshwater species.

SOURCES:  
Service and U.S. Bureau of Census, 1982, 1989, and 1993.

### COMMERCIAL SALMON FISHING

Commercial fishing for salmon has occurred in the Pacific Coast Region since the early 1890s. This section discusses the historical economic activity of the commercial salmon industry and identifies trends associated with that activity beginning in 1971. Where possible, data are presented in five-year averages, beginning with the 1971-1975 period.

#### Salmon Fishing Vessel Permits and Vessels Landing Salmon

Table II-3 shows the number of permits issued and the number of vessels landing salmon annually between 1980 and 1990 in the Pacific Coast Region. The proportion of vessels with salmon permits landing salmon averaged 65 percent between 1980 and 1990. This percentage was highest in 1988 at 74 percent and lowest in 1981 at 59 percent. The trend over the 11-year period was fairly flat; the percentage in 1990 was 63 percent, only 2 percent higher than in 1980.

The total number of salmon fishing vessel permits and vessels landing salmon has shown an overall decline over the 11-year period. This downward trend is best explained as a result of the deteriorating salmon fishery and increasingly stricter regulations that limit the extent of the salmon season and harvesting areas.

TABLE II-3

**NUMBER OF SALMON VESSEL PERMITS ISSUED AND VESSELS  
LANDING SALMON IN THE PACIFIC COAST REGION**

Year	Vessels with Permits	Vessels Landing Salmon	Vessels Landing Salmon as Percentage of Vessels with Permits
1980	7,744	4,738	61
1981	6,990	4,102	59
1982	5,964	4,013	67
1983	4,617	3,223	70
1984	4,180	2,569	61
1985	3,869	2,308	60
1986	3,753	2,582	69
1987	3,533	2,442	69
1988	3,493	2,571	74
1989	3,464	2,534	73
1990	3,372	2,115	63
11-Year Average	4,634	3,017	65
SOURCE: PFMC, 1993b.			

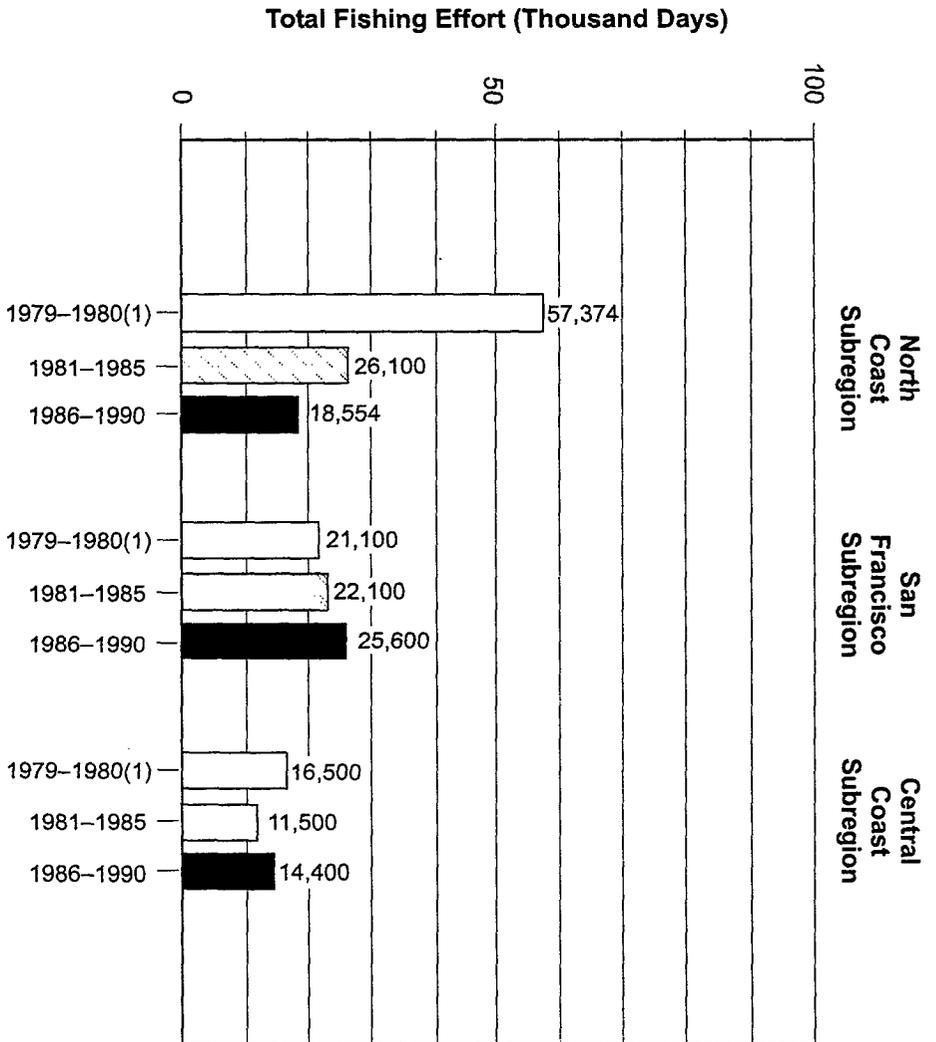
### Salmon Management and Fishing Effort

The Pacific Fishery Management Council (PFMC) has regulated commercial salmon fishing in California since 1977. This regulation has substantially affected fishing in some regions by reducing the number of days allowed for fishing compared to the traditional season (May 1 to October 1).

Figure II-3 shows the average number of days fished annually by commercial fishing vessels along the Pacific Coast Region in five-year increments since 1976. Commercial salmon fishing effort in the entire Pacific Coast Region has declined by approximately 40 percent between the late 1970s and the 1985-1990 period. Days fished increased in the San Francisco and Central Coast subregions but declined in the North Coast Subregion in the most recent period (1986-1990) compared with the preceding period (1981-1985). The North Coast Subregion, which ranked first regionally in total days fished during the late 1970s, declined in the successive five-year periods and ranked second regionally during the 1986-1990 period. Total days fished annually in this subregion during the 1986-1990 period were only 32 percent of the total in the late 1970s.

**HISTORICAL TRENDS IN AVERAGE ANNUAL OCEAN COMMERCIAL SALMON FISHING EFFORT IN THE PACIFIC COAST REGION**

**FIGURE II-3**



NOTE:  
(1) = No data available before 1979.

SOURCE:  
PFMC, 1993b.

## Pounds and Ex-Vessel Value of Salmon Landings

Table II-4 shows the total pounds of salmon landed by subregion in the Pacific Coast Region in five-year increments. Except in the Central Coast Subregion, total pounds landed declined through the 1981-1985 period compared with the 1971-1975 period. During the most recent period (1986-1990), pounds landed increased in all the subregions. Pounds landed increased the most in the San Francisco Subregion, at 151 percent.

**TABLE II-4**  
**AVERAGE TOTAL POUNDS OF SALMON LANDED ANNUALLY IN THE**  
**PACIFIC COAST REGION**

Subregion	1971-1975	1976-1980	1981-1985	1986-1990
North Coast	4.79	4.25	2.16	3.06
San Francisco	2.39	1.83	1.79	4.49
Central Coast	0.88	0.93	0.97	1.59
<b>Total</b>	8.06	7.01	4.92	9.14

NOTE:  
Amounts represent millions of pounds.

SOURCE:  
PFMC, 1993b.

Table II-5 shows the ex-vessel value (in nominal and real terms) of salmon sold by region in five-year increments. During the most recent period (1986-1990), the nominal ex-vessel value (expressed in current-year dollars) of all salmon sold in the Pacific Coast Region exceeded sales in the 1976-1980 period by \$5.4 million. Real values (expressed in constant 1992 dollars), however, declined compared with real values of the 1976-1980 period, averaging about \$3.7 million less for the 1986-1990 period.

The North Coast Subregion, which ranked first in both nominal and real values during the 1976-1980 period, rebounded in annual sales during the 1986-1990 period; however, the increase did not raise the value to the level in the 1976-1980 period. The Central Coast Subregion showed an increase in nominal value in each successive period.

### Economic Importance of the Salmon Fishing Industry

Since 1976, the PFMC has estimated the personal income generated by the commercial salmon industry. These estimates include direct, indirect, and induced income derived from landing sales and salmon processing. Table II-6 shows the income derived from the salmon industry compared with total regional personal income, expressed in 1992 dollars.

TABLE II-5

**AVERAGE ANNUAL EX-VESSEL VALUE OF SALMON LANDED AT PORTS IN THE  
PACIFIC COAST REGION**

Subregion	Nominal Value (1) (millions of dollars)				Real Value (2) (millions of dollars)			
	1971-1975	1976-1980	1981-1985	1986-1990	1971-1975	1976-1980	1981-1985	1986-1990
North Coast	NA	9.55	4.99	7.31	NA	16.90 (3)	6.99	8.81
San Francisco	NA	3.91	4.33	9.70	NA	7.73 (3)	6.08	11.32
Central Coast	NA	2.20	2.34	4.08	NA	3.92 (3)	3.28	4.75
<b>Total</b>	<b>NA</b>	<b>15.66</b>	<b>11.66</b>	<b>21.09</b>	<b>NA</b>	<b>28.55</b>	<b>16.35</b>	<b>24.88</b>

NOTES:  
 (1) Value in current-year dollars.  
 (2) Value expressed in constant 1992 dollars.  
 (3) Based on average costs per pound for 1979 and 1980.

SOURCE:  
 PFMC, 1993b.

LEGEND:  
 NA = No information currently available.

**TABLE II-6**

**AVERAGE INCOME GENERATED ANNUALLY BY THE COMMERCIAL SALMON INDUSTRY COMPARED WITH TOTAL REGIONAL PERSONAL INCOME IN THE PACIFIC COAST REGION**

Subregion	Income from Salmon (millions of 1992 dollars)			Total Regional Income (1) (millions of 1992 dollars)			Percentage of Income from Salmon (percentage of total income)		
	1976-1980	1981-1985	1986-1990	1976-1980	1981-1985	1986-1990	1976-1980	1981-1985	1986-1990
North Coast	29.9	12.1	14.9	1,503	2,165	3,030	1.99	0.56	0.50
San Francisco	16.1	12.8	22.8	42,260	51,643	58,387	0.04	0.02	0.04
Central Coast	7.0	4.3	8.5	13,750	17,444	20,323	0.05	0.02	0.04
<b>Total</b>	<b>53.0</b>	<b>29.2</b>	<b>46.2</b>	<b>57,513</b>	<b>71,252</b>	<b>81,740</b>	<b>0.09</b>	<b>0.04</b>	<b>0.06</b>

NOTE:  
 (1) Total regional income includes total income in the counties that constitute each region. Personal income estimate includes all direct, indirect, and induced income wages, salaries, and profits that are attributable to the salmon industry.

SOURCES:  
 PFMC, 1986, 1993b; U.S. Bureau of the Census, 1992; California Department of Finance, 1993; U.S. Bureau of Economic Analysis, 1992, 1993; Seger, pers. comm.

The San Francisco and Central Coast subregions show a very small percentage of income from the salmon industry compared with total personal income. The relatively large populations within these subregions help explain the relatively small percentages. Personal income from commercial salmon fishing in the North Coast Subregion approached 2 percent of total personal income in the region during the 1976-1980 period but then fell more than 70 percent to 0.5 percent during the most recent period (1986-1990).

## **CONCLUSIONS**

Economic activity related to the commercial and recreational salmon fisheries in the study area has declined substantially since the early 1970s.

As shown in Figure II-4, personal income from the commercial and ocean sport salmon fisheries along the Pacific Coast Region reached a low in the early 1980s and recovered in the late 1980s, although not to the levels of the late 1970s. Data for 1992 indicate near-record low levels.

Other key economic indicators for the commercial salmon industry include the relative importance of salmon to the regional economies and the number of vessels obtaining salmon permits. Since the late 1970s, the commercial salmon fishing industry has become less important to the regional economies of the Pacific Coast Region. The number of vessels obtaining permits to fish for salmon declined by about 40 percent in this region between 1980 and 1990.

## **RECENT CONDITIONS**

This section describes recent economic conditions pertaining to recreation and commercial fishing activities. Information is presented for those regions in the study area potentially affected by implementation of the CVPIA. When available, 1992 data were used to describe recent conditions; otherwise, the most recent available information was used and assumed to represent recent conditions. It should be noted that 1992 was not representative of longer term conditions because of dry weather conditions and low salmon harvest levels.

## **SACRAMENTO RIVER REGION**

The economic importance of recreation is often characterized in terms of recreation-related expenditures and recreation benefits. Recreation-related expenditures generate economic activity that can be measured in terms of changes in personal income and employment in a region. Recreation benefits are a measure of social welfare or the value placed on recreation opportunities; these values can be expressed in monetary terms. For this description, these indicators are used to characterize the economic importance of recreation activity at affected recreation areas.

In 1992, recreation use at the 10 recreation areas in the Sacramento River Region totaled approximately 3.6 million visitor days (Table II-7). It is estimated that approximately \$70 million in trip-related spending resulted from this use, based on an average spending per visitor day (Table II-8) of \$16.25 for nonconsumptive activities at reservoirs, rivers, and wildlife refuges

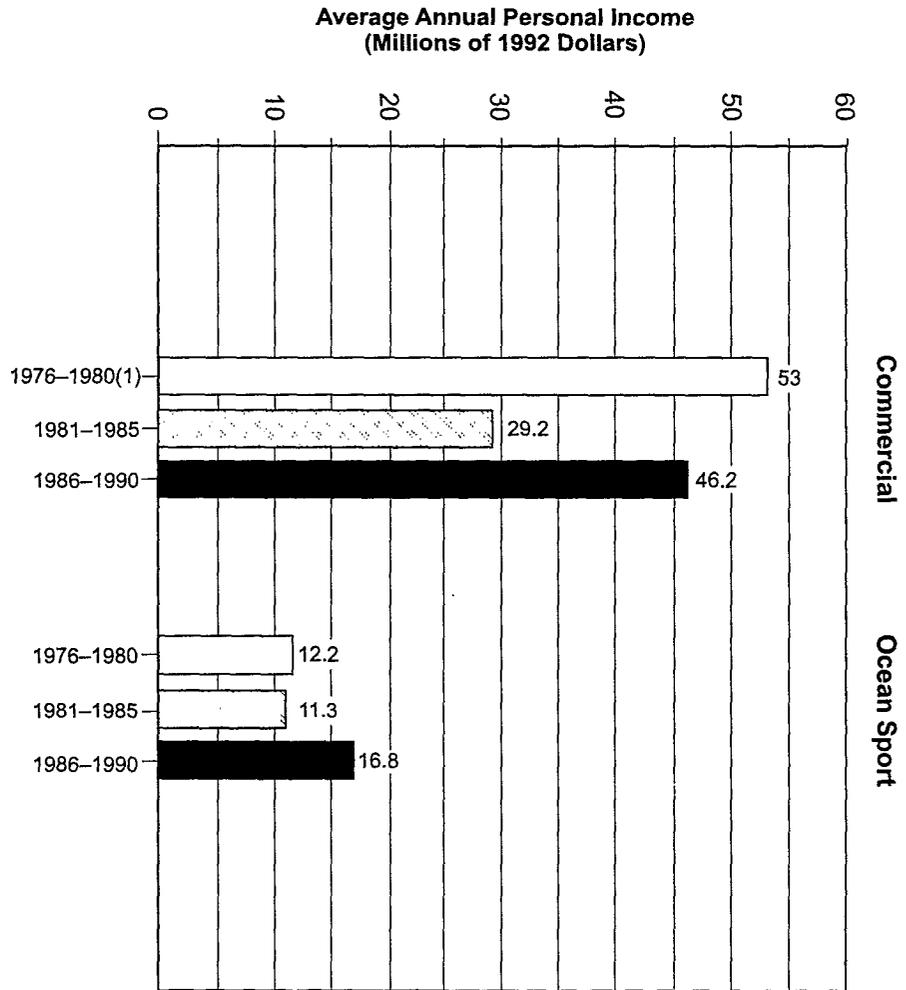


FIGURE II-4

HISTORICAL TRENDS IN AVERAGE PERSONAL INCOME GENERATED BY OCEAN COMMERCIAL AND SPORT FISHING FOR SALMON IN THE PACIFIC COAST REGION

NOTE:  
 (1) = Data available for 1979 and 1980 only.  
 SOURCE:  
 PFMC, 1993a.

TABLE II-7

**ECONOMIC FACTORS RELATED TO RECREATION USE AT KEY SACRAMENTO RIVER  
REGION RECREATION AREAS IN 1992**

Recreation Area	Direct Regional Economic Effect					
	Visitor Days (1) (thousands of days)	Proportion of Visitors from the Region (percent)	Regional Expenditures (2) (millions of 1992 dollars)	Personal Income (millions of 1992 dollars)	Employment (person-years)	Benefits (3) (millions of 1992 dollars)
Lakes						
Shasta	2,422	50	43.0	21.0	1,376	23.3
Oroville	418	80	6.5	3.2	205	4.0
Folsom	362	90	7.8	3.9	246	3.5
Rivers (4)						
Sacramento	160	77	6.9	3.4	218	2.9
Feather	69	85	3.0	1.5	95	1.2
American	27	90	1.2	0.6	38	0.5
Yuba (5)	2	75	0.09	0.04	3	0.04
Wildlife Refuges	103	50	2.1	1.0	67	2.2
<b>Total</b>	<b>3,563</b>		<b>70.59</b>	<b>34.64</b>	<b>2,248</b>	<b>37.64</b>
NOTES:						
(1) Estimated from information presented in the Recreation Technical Appendix.						
(2) Includes 80 percent of expenditures made by visitors from outside the region and 100 percent of expenditures made by visitors from inside the region.						
(3) Measured in terms of users' net willingness to pay for recreation opportunities.						
(4) Includes sport fishing activities only.						
(5) Yuba River data reported to two decimal places due to small magnitude of dollars.						

TABLE II-8

**AVERAGE TRIP-RELATED EXPENDITURES BY PRINCIPAL RECREATION ACTIVITY  
AND SPENDING CATEGORY**

Business Sector	Saltwater Fishing (1)				Nonconsumptive Recreation Uses (3)
	Freshwater Fishing (2)	Charter	Private	Waterfowl Hunting (2)	
Food stores	4.68	3.48	3.97	5.81	2.89
Eating and drinking establishments	9.50	6.97	7.96	11.65	2.16
Service stations	16.42	11.94	24.01	12.14	3.64
Hotels and motels	9.60	6.96	7.94	4.50	4.66
Miscellaneous retail	5.26	67.97	22.63	6.18	2.90
<b>Total</b>	<b>45.46</b>	<b>97.32</b>	<b>66.51</b>	<b>40.28</b>	<b>16.25</b>

NOTES:  
 Values are in 1992 dollars per visitor day.  
 Expenditure estimates were adjusted to constant 1992 dollars using the Consumer Price Index for the West Coast.

SOURCES:  
 (1) Thomson and Huppert, 1987.  
 (2) Service and U.S. Bureau of the Census, 1993.  
 (3) Propst et al., 1992.

(primary activities associated with boating, swimming, and wildlife observation); \$45.46 for sport fishing activities at reservoirs, rivers, and wildlife refuges; and \$40.28 for waterfowl hunting at wildlife refuges (Service and U.S. Bureau of the Census, 1993). Based on the spending profiles presented in Table II-8 and the direct impact coefficient derived from IMPLAN, this spending (\$70.6 million) is estimated to have generated \$34 million in personal income and 2,248 person-years of employment in the recreation-related sectors of the regional economies identified in Figure I-1.

Of particular economic importance to the City of Red Bluff area is Lake Red Bluff, which is located on the Sacramento River. Since 1964, the lake level has been held constant between May and September using river gates. The constant lake level supports flatwater recreation, including boating, water skiing, and swimming. Special events also occur at Lake Red Bluff during the summer, including the annual boat drag races and the squawfish derby. Under current operation, the gates are lowered in late September and the lake is allowed to drain.

In 1995, total recreation use at Lake Red Bluff was estimated to be approximately 64,000 visitor days (California State University, Chico Foundation, 1996). Use during the peak summer season (May through September) when the gates are up is estimated to account for approximately 76 percent of total annual use. Local residents (i.e., those who live within 15 miles of the lake) account for about 65 percent of all users; residents located within 30 miles of the lake account for approximately 80 percent of users.

Recreation benefits, as measured by recreationists' willingness to pay for recreation opportunities in addition to actual expenditures, are estimated at \$37.6 million for 1992 (Table II-7). This estimate is based on an average benefit of \$9.60 per visitor day for reservoir recreation (Spectrum Economics, 1991); \$18 per visitor day for river recreation (Loomis and Ise, 1992); \$21 per visitor day for recreation activities at wildlife refuges, which represents an average value for wildlife viewing and fishing activities (valued at \$18 per day by Cooper and Loomis [1991]) and waterfowl hunting (valued at \$24 per day by Cooper [1990]) at wildlife refuges. Benefits are expressed in 1992 dollars.

## **SAN JOAQUIN RIVER REGION**

In 1992, recreation use at the seven reservoirs, four rivers, and five wildlife refuges in the San Joaquin River Region totaled approximately 2.9 million visitor days (Table II-9). Trip-related expenditures resulting from this use reached \$52.3 million, which generated \$25.8 million in personal income and 1,721 person-years of employment in the regional economy.

Recreation benefits associated with use at the key recreation areas in the San Joaquin River Region in 1992 are estimated at \$33.5 million.

## **TULARE LAKE REGION**

Based on information presented in the Recreation Technical Appendix, it is estimated that recreation use related to both waterfowl hunting and wildlife observation at the Kern National

TABLE II-9

**ECONOMIC FACTORS RELATED TO RECREATION USE AT KEY  
SAN JOAQUIN RIVER REGION RECREATION AREAS IN 1992**

Recreation Area	Visitor Days (1) (thousands of days)	Proportion of Visitors from the Region (percent)	Regional Expenditure (2) (millions of 1992 dollars)	Direct Regional Economic Effects		
				Personal Income (millions of 1992 dollars)	Employment (person-years)	Benefits (3) (millions of 1992 dollars)
<b>Reservoirs and Lakes</b>						
CVP Reservoirs						
San Luis	210	30	4.7	2.3	155	2.0
Millerton	316	70	5.0	2.5	165	3.0
New Melones	498	75	7.7	3.8	254	4.8
Non-CVP Reservoirs						
McClure	606	75	9.4	4.6	310	5.8
New Don Pedro	280	75	4.3	2.1	142	2.7
New Hogan	185	75	3.4	1.7	112	1.8
Camanche	258	65	4.0	2.0	132	2.5
<b>Rivers (4)</b>						
San Joaquin	157	65	4.5	2.2	147	2.8
Merced	109	75	3.0	1.5	98	2.0
Tuolumne	150	75	2.7	1.3	88	2.7
Stanislaus	122	75	2.4	1.2	78	2.2
<b>Wildlife Refuges</b>	56	50	1.2	0.6	40	1.2
<b>Total</b>	<b>2,947</b>		<b>52.3</b>	<b>25.8</b>	<b>1,721</b>	<b>33.5</b>
<b>NOTES:</b>						
(1) Estimated from information presented in the Recreation Technical Appendix.						
(2) Includes 80 percent of expenditures made by visitors from outside the region and 100 percent of expenditures by visitors from inside the region.						
(3) Measured in terms of users' net willingness to pay for recreation opportunities.						
(4) Includes fishing, boating, swimming, and wildlife viewing activities.						

Wildlife Refuge (NWR) totaled approximately 2,700 visitor days in 1992. These activities resulted in approximately \$76,000 in annual trip-related spending.

Annual recreation benefits associated with waterfowl hunting at the Kern NWR are estimated at \$83,700, based on an average benefit of \$31 per day.

## **SAN FRANCISCO BAY/SACRAMENTO-SAN JOAQUIN DELTA REGION**

Total recreation use in the Bay-Delta Region in 1992 is estimated to approximate 7 million visitor days (Wade et al., 1987). Sport fishing in 1985 accounted for an estimated 205,000 visitor days, which resulted in approximately \$8.9 million in annual trip-related spending.

Recreation benefits associated with this sport fishing activity are estimated at \$3.7 million based on an average benefit of \$18 per day.

## **PACIFIC COAST REGION**

The salmon sport and commercial fishery for the Pacific Coast Region includes portions of the California coast from Monterey County to the Oregon border (Figure II-1).

### **Sport Fishing Activity**

Saltwater fishing for salmon in the Pacific Coast Region accounted for an estimated 127,000 visitor days of recreation in 1992. Private fishing vessels accounted for approximately 80,000 visitor days of recreation, and charter vessels accounted for the remaining 47,000 visitor days (vessel types are aggregated in Table II-10). Nearly 50 percent of this activity occurred in the San Francisco Subregion. Total use resulted in an estimated \$9.6 million in trip-related expenditures, which generated an estimated \$4.9 million in personal income and 298 person-years of employment in the regional economy.

Annual recreation benefits associated with this activity are estimated at \$8.1 million, based on an average benefit of \$64 per day of salmon sport fishing.

### **Commercial Fishing Activity**

Important indicators of economic conditions pertaining to the commercial salmon industry include the following:

- management restrictions on salmon harvesting
- number of vessels landing salmon
- total commercial fishing days
- total pounds of salmon landed
- ex-vessel value of salmon landed

These indicators are described below for 1992. In addition, the economic impacts of salmon harvesting and processing, as measured in terms of personal income and employment, are

TABLE II-10

**ECONOMIC EFFECTS RELATED TO SALMON SPORT FISHING IN THE  
PACIFIC COAST REGION IN 1992**

Subregion	Visitor Days (1) (thousands of days)	Proportion of Visitors from the Region (2) (percent)	Regional Expenditures (3) (millions of 1992 dollars)	Direct Regional Economic Effects		
				Personal Income (millions of 1992 dollars)	Employment (person-years)	Benefits (4) (millions of 1992 dollars)
North Coast	30	65	1.9	0.9	67	1.9
San Francisco	62	85	5.1	2.7	148	3.9
Central Coast	35	75	2.6	1.3	83	2.2
<b>Total</b>	<b>127</b>		<b>9.6</b>	<b>4.9</b>	<b>298</b>	<b>8.0</b>

NOTES:  
 (1) Derived from information presented in the Recreation Technical Appendix.  
 (2) Derived from information provided by Thomson and Huppert, 1987.  
 (3) Includes 80 percent of expenditures made by visitors from outside the local area and 100 percent of expenditures by visitors from the region.  
 (4) Measured in terms of users' net willingness to pay for recreation opportunities.

estimated and compared with total personal income and employment for the region. Also presented are the number of pounds and ex-vessel value of salmon landed in each subregion compared with the total amount of seafood landed in each subregion.

**Management of Commercial Salmon Fishing.** The 1992 regulations for managing the commercial salmon fishery in the Pacific Coast Region are shown in Table II-11. The North Coast Subregion is located in two management areas: the United States-Mexico Border to Horse Mountain Management Area, and the Horse Mountain to Humbug Mountain Management Area (also known as the Klamath Management Zone) (Figure II-5). In 1992, commercial salmon fishing was not allowed in the North Coast Subregion except in a small area near Fort Bragg.

Commercial salmon fishing in the southern portion of the San Francisco Subregion, which is within the United States-Mexico Border to Horse Mountain Management Area, was not restricted in 1992. The northern portion of the San Francisco Subregion (north of Point Reyes) was closed in May, June, and July.

The Central Coast Subregion, which includes Monterey Bay, is located in the United States-Mexico Border to Horse Mountain Management Area. Commercial salmon fishing was not restricted in this area in 1992.

**Commercial Salmon Fishing Vessel Permits and Vessels Landing Salmon.** In 1992, California Department of Fish and Game (DFG) sold 2,970 salmon fishing vessel permits; 1,093 of the permitted vessels, or 37 percent, landed salmon. The major reasons for the low percentage of permitted vessels landing salmon are the deteriorating conditions in the salmon fishery and the closure of large areas of the coast to commercial salmon fishing in 1992.

During 1992, 3,442 commercial salmon fishing stamps were sold in California, generating \$378,620 in revenues.

**Days Fished, Pounds Landed, and Ex-Vessel Value.** The number of pounds of salmon landed and price paid to the angler were compiled from market receipts (pink tickets) provided to fish dealers and processors by DFG (PFMC, 1993a). This information includes the date of the transaction, the permit number of the vessel, and the angler's name.

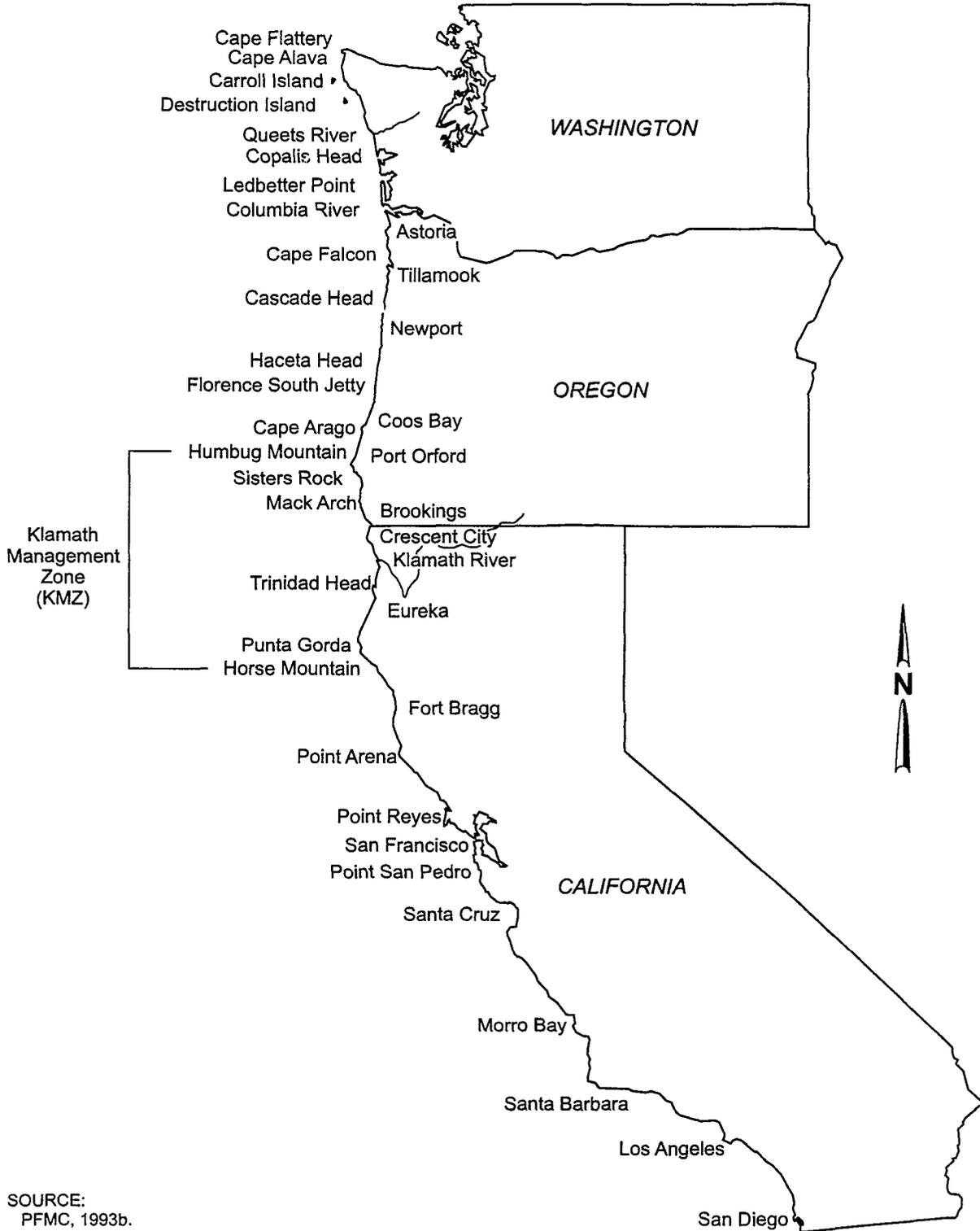
In 1992, the North Coast Subregion accounted for less than 1 percent of the fishing effort, 1.3 percent of pounds landed, and 1.1 percent of the ex-vessel value of all salmon landed at ports in the Pacific Coast Region (Table II-12). The San Francisco Subregion accounted for 32 percent of the fishing effort, 61 percent of the pounds of salmon landed, and 62 percent of ex-vessel value of all salmon landed at ports in the Pacific Coast Region. The Central Coast Subregion accounted for 68 percent of the fishing effort, 37 percent of the pounds of salmon landed, and 37 percent of the ex-vessel value of all salmon landed at ports in the Pacific Coast Region.

**Economic Importance of the Salmon Fishing Industry.** Two key indicators of the economic importance of the commercial salmon fishing industry are the relative poundage and ex-vessel value of salmon landed in proportion to the total pounds and value for all commercial

TABLE II-11

**1992 MANAGEMENT RESTRICTIONS ON COMMERCIAL SALMON FISHING IN THE PACIFIC COAST REGION**

<b>Management Area/Subarea</b>	<b>Commercial Salmon Fishing Regulations</b>
United States-Mexico Border to Horse Mountain	The area between Point San Pedro and Point Arena was closed in May, June, and July, with the exception of a 10-day fishery between Point Reyes and Point San Pedro in May. There was no troll fishery between Point Arena and Horse Mountain. The area south of Point San Pedro opened May 1 and was open continuously until September 30.
Horse Mountain to Humbug Mountain (Klamath Management Zone)	Troll fisheries were not permitted in the Klamath Management Zone in 1992.
Humbug Mountain to Cape Falcon	
Humbug Mountain to Florence South Jetty	The chinook fishery was closed except during the period from October 24 to October 26.
Florence South Jetty to Cascade Head	The all-salmon-except-coho fishery was open from May 1 through May 31. The fishery reopened to all salmon fishing, under a ratio of one chinook to each two coho, from July 22 through August 7, when the coho ceiling for the area from the United States-Mexico Border was attained. The subarea reopened from August 8 through October 31 as an all-salmon-except-coho fishery.
Cascade Head to Cape Falcon	The all-salmon-except-coho fishery was open from May 1 through May 31. The fishery reopened to all-salmon fishing, under a ratio landing restriction of at least one chinook to each two coho, from July 22 through August 21.  The fishery reopened from September 1 through October 31 as an all-salmon-except-coho fishery.
<p>NOTE: In addition to the restrictions specific to the management areas, a quota of 57,000 coho salmon was established for the area from Cape Falcon to the United States-Mexico border.</p> <p>SOURCE: PFMC, 1993b.</p>	



SOURCE:  
PFMC, 1993b.

FIGURE II-5

**GEOGRAPHIC LOCATIONS USED IN DESCRIBING MANAGEMENT AREAS FOR COMMERCIAL FISHING ALONG THE PACIFIC COAST**

**TABLE II-12**

**COMMERCIAL SALMON FISHING ACTIVITY IN THE PACIFIC COAST REGION IN 1992**

<b>Subregion</b>	<b>Fishing Effort (days fished)</b>	<b>Pounds of Salmon Landed (thousands)</b>	<b>Total Pounds Landed (millions) (1)</b>	<b>Ex-Vessel Value of Salmon (millions of 1992 dollars)</b>	<b>Total Ex-Vessel Value of All Seafood Landed (millions of 1992 dollars) (1)</b>
North Coast	N/A (2)	21.5	77.2	0.05	38.6
San Francisco	6,300	989.0	56.1	2.71	35.9
Central Coast	13,500	603.0	72.1	1.64	38.7
<b>Total</b>	<b>19,900</b>	<b>1,613.5</b>	<b>205,400</b>	<b>4.40</b>	<b>113.2</b>

NOTES:  
 (1) Total pounds landed and total ex-vessel values include information on all species landed in the subregions.  
 (2) Data for fishing effort in the subregions were unavailable but were very small in 1992 because of closure of the Klamath Management Zone to commercial fishing.

SOURCES:  
 California Department of Finance, 1993; PFMC, 1993a; U.S. Bureau of the Census, 1994.

LEGEND:  
 NA = No information on the subregion is currently available.

seafood landed at ports in each subregion. In 1992, salmon accounted for 0.03 percent of the total pounds of seafood landed and 0.13 percent of the total ex-vessel value of seafood landed in the North Coast Subregion (Table II-12). Salmon accounted for 2.0 percent of total pounds of seafood landed and 8.0 percent of the ex-vessel value of all seafood landed in the San Francisco Subregion. Salmon accounted for 0.83 percent of the total pounds of seafood landed and 4.2 percent of the ex-vessel value of all seafood landed in the Central Coast Subregion.

The relative amount of personal income generated by the salmon industry also indicates the economic importance of the industry to a region. In 1992, the salmon industry (including harvesting and processing activities) in the North Coast Subregion generated \$90,000 in personal income, which accounted for less than 0.01 percent of the total personal income generated in this subregion (Table II-13). In the San Francisco Subregion the salmon industry generated \$5.4 million in 1992, which accounted for approximately 0.01 percent of the total personal income generated in this subregion and for 66 percent of all income generated by the salmon industry in the Pacific Coast Region.

In the Central Coast Subregion, the salmon industry generated \$2.7 million in 1992, approximately 0.01 percent of the total personal income generated in this subregion and 33 percent of all income generated by the salmon industry in the Pacific Coast Region.

**Employment.** The employment generated by the commercial salmon fishing industry also indicates the economic importance of the salmon industry to a region. In 1992, the salmon industry in the Pacific Coast Region supported an estimated 547 person-years of employment, which accounted for 24 percent of the total number of person-years of employment in the commercial fishing industry in the Pacific Coast Region (IMPLAN, 1990).

The number of persons engaged in commercial fishing for salmon was estimated as follows. The number of vessels landing salmon in 1992 was multiplied by the estimated number of persons employed per vessel, which was assumed to be two (Baracco, pers. comm.). This number of employed persons was then multiplied by 25 percent (three months), which is the assumed average proportion of the year that anglers are engaged in salmon fishing. Historically, the fishing season was more than five months long.

TABLE II-13

**1992 INCOME GENERATED FROM THE SALMON INDUSTRY COMPARED TO  
TOTAL PERSONAL INCOME IN THE PACIFIC COAST REGION**

<b>Subregion</b>	<b>Total Personal Income from Salmon (millions of 1992 dollars)</b>	<b>Total Personal Income in the Region (millions of 1992 dollars)</b>	<b>Income from Salmon Industry (percent of regional income)</b>
North Coast	0.09	3,722	0.002
San Francisco	5.40	59,031	0.009
Central Coast	2.70	21,167	0.013
<b>Total</b>	<b>8.19</b>	<b>83,920</b>	<b>0.010</b>

NOTES:  
 Personal income includes all direct, indirect, and induced income (wages, salaries, and profits) attributable to the salmon industry. Subregions include the following counties:  
 North Coast: Del Norte, Humboldt, and Mendocino.  
 San Francisco: Sonoma, Marin, San Francisco, and San Mateo.  
 Central Coast: Santa Cruz, Monterey, and Santa Barbara.  
 The total percent income from salmon industry is the weighted average of the three subregions.

SOURCES:  
 Salmon income data from PFMC, 1993a.  
 Regional income data from the California Department of Finance, 1993.

**CHAPTER III**

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**ENVIRONMENTAL CONSEQUENCES**

## Chapter III

# ENVIRONMENTAL CONSEQUENCES

## ANALYSIS METHODOLOGY

The assessment of impacts on fish, wildlife, and recreation economics includes an analysis of the effects of implementing the CVPIA on recreation economics (including sport fishing) and on commercial fisheries. Because the PEIS does not estimate specific fish population numbers associated with each alternative, two analyses were conducted. An alternatives-based analysis, which is described in this chapter, identifies changes in recreation-related spending and benefits resulting from changes in use affected by the hydrologic conditions in each of the four action alternatives. A scenario-based analysis, which is described in Attachment A, identifies changes in sport fishing-related spending and benefits and changes in economic activity related to commercial salmon fishing associated with a range of enhanced harvest scenarios.

The data used to conduct these analyses are consistent with the "Central Valley Project Improvement Act Report to Congress - Report to Congress on the Central Valley Project Impacts to the Anadromous Fish Resource, Fisheries, and Associated Economic, Social, or Cultural Interests" (Service, 1995). A more detailed description of the methodologies used to analyze these effects is provided in the Fish, Wildlife, and Recreation Economics Methodology/Modeling Technical Appendix.

Figure III-1 highlights the analytic framework used to assess the effects on recreation-related spending and recreation benefits associated with changes in hydrology under the CVPIA alternatives. The analysis of both of these effects depends on predicted changes in recreation use, which would occur at reservoirs operated by the CVP, State Water Project (SWP), and other water agencies; rivers and streams below these reservoirs; federal and state wildlife refuges; and coastal waters. In this analysis, changes in recreation-related expenditures relate only to the expenditures of recreationists that are made within the region of interest. For instance, for a family from San Francisco visiting Shasta Lake, only those expenditures made within the Sacramento River Region would be counted. On the other hand, recreation benefits measure recreationists' additional willingness to pay for recreation opportunities. Because these benefits are not actual expenditures (and thus not tied to a geographic location), all of these benefits are reported.

Estimates of recreation use described in the Recreation Technical Appendix were used to estimate these effects. As described in the Recreation Methodology/Modeling Technical Appendix, the estimated changes in use are based on predicted changes in hydrologic conditions.

For estimating changes in recreation trip-related spending, spending profiles were developed and applied to changes in recreation use at each affected recreation area. This procedure resulted in

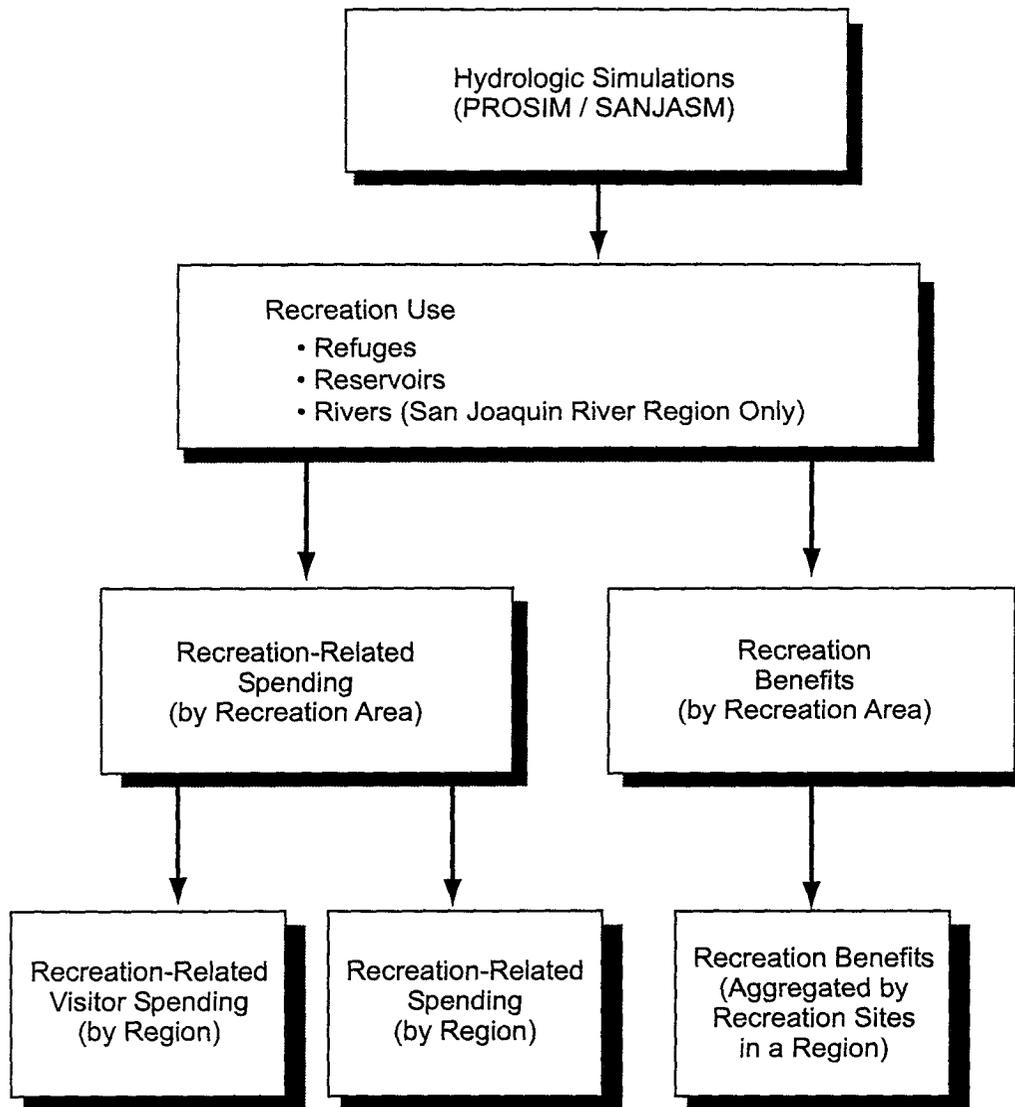


FIGURE III-1

**ANALYTIC FRAMEWORK FOR ASSESSING  
ALTERNATIVES-BASED ECONOMIC EFFECTS**

estimates of spending by recreationists associated with predicted visitation at each site. A final step was to estimate changes in recreation-related visitor spending by region for use as one component of the Regional Economics Technical Appendix.

As described in more detail in the Fish, Wildlife, and Recreation Economics Methodology/Modeling Technical Appendix, assumptions were developed concerning the percentage of recreation-related spending incurred by residents and nonresidents within the region in which each site is located. These assumptions allowed for estimating the change in recreation-related spending by visitors to the regions where recreation areas are located.

As shown in Figure III-1, predictions of recreation use are also used to estimate changes in recreation benefits in terms of "net" willingness to pay. Recreation benefits are a measure of recreation value above what recreationists actually spend; as such, these benefits provide a net value in terms of the additional amount that recreationists would be willing to pay to recreate. This economic measure is used in benefit/cost analyses to determine the social welfare consequences of alternative actions.

Estimates of recreation benefits per visitor day, derived either from the use-estimating models or from the existing literature, were then multiplied by the predicted number of visitor days at each site to estimate recreation benefits.

## NO-ACTION ALTERNATIVE

### SACRAMENTO RIVER REGION

#### Recreation-Related Spending

Projected annual recreation-related spending levels at affected reservoirs and wildlife refuges in the Sacramento River Region under the No-Action Alternative are shown in Table III-1. Projected spending includes recreation-related purchases made within the Sacramento River Region by residents of the region and by people visiting regional recreation areas who live in other regions. It excludes recreation-related purchases made outside the region by visitors in preparation for their trips or en route to regional recreation areas.

Total spending associated with use of affected reservoirs in the Sacramento River Region in 2020 under the No-Action Alternative is projected to be approximately \$141 million (Table III-1). Shasta Lake is the predominant recreation area in the Sacramento River Region, accounting for 72 percent of the total spending associated with use of regional reservoirs. Folsom Lake and Lake Oroville are the second and third leading areas in the region, each accounting for 14 percent of spending at affected regional reservoirs.

Recreation use of Sacramento River Region wildlife refuges would result in annual expenditures of approximately \$3.4 million (Table III-1).

TABLE III-1

**ANNUAL RECREATION TRIP-RELATED EXPENDITURES AT KEY RECREATION AREAS  
IN THE SACRAMENTO RIVER REGION**

Recreation Area	No-Action Alternative	Changes Compared to No-Action Alternative			
		Alternative 1	Alternative 2	Alternative 3	Alternative 4
<b>Lakes</b>					
Shasta	101,821	0*	0*	0*	0*
Oroville	19,492	0*	0*	0*	0*
Folsom	19,727	0*	0*	0*	0*
<b>Subtotal</b>	<b>141,040</b>	<b>0*</b>	<b>0*</b>	<b>0*</b>	<b>0*</b>
Wildlife Refuges	3,434	848	2,206	2,206	2,206
<b>Total</b>	<b>144,474</b>	<b>848</b>	<b>2,206</b>	<b>2,206</b>	<b>2,206</b>
<p>NOTES:</p> <p>All values are expressed in thousands of 1992 dollars.</p> <p>The term "0*" denotes a change of less than 3 percent compared with the value associated with the No-Action Alternative. These changes are considered within the margin of error of the models and consequently are treated as zeros.</p> <p>Because of model limitations, wildlife refuge values should be interpreted as indicators of potential changes.</p> <p>Values associated with changes to sport fishing in rivers of the region are described in Attachment A, "Effects of Improvements in Anadromous Fisheries."</p>					

Sport fishing-related spending at affected rivers in the Sacramento River Region, which is estimated to average approximately \$19.2 million annually under the No-Action Alternative, is presented in detail in Table A-1 in Attachment A, "Effects of Improvements in Anadromous Fisheries".

Total recreation-related spending at affected facilities (excluding rivers) in the Sacramento River Region is estimated to average approximately \$144 million annually, with affected reservoirs accounting for about 98 percent of this value.

### **Recreation-Related Spending by Visitors to a Region**

Table III-2 shows No-Action Alternative levels of recreation-related spending only by visitors at affected facilities in each affected study area region. Visitors are defined as users of recreation areas who reside outside the region in which the area is located. The portion of total recreation-related spending accounted for by visitors is the basis for the economic impact assessment in the Regional Economics Technical Appendix. Under the No-Action Alternative, recreation-related spending by visitors to the Sacramento River Region is estimated at approximately \$54 million.

### **Recreation Benefits**

The benefits of recreation activity at affected reservoirs and lakes in the Sacramento River Region are estimated to average approximately \$209 million annually under the No-Action Alternative (Table III-3). Seventy-four percent of this value is associated with recreation activity at Shasta Lake.

The benefits of recreation activity at state and federal wildlife refuges in the Sacramento River Region are estimated to average approximately \$2.1 million annually under the No-Action Alternative.

The benefits of recreation activity at affected rivers in the Sacramento River Region, which are estimated to average approximately \$5.6 million annually under the No-Action Alternative, are presented in detail in Table A-2 in Attachment A, "Effects of Improvements in Anadromous Fisheries."

Total recreation benefits at affected facilities (excluding rivers) in the Sacramento River Region are estimated to average approximately \$211 million annually, with affected reservoirs accounting for about 99 percent of this value.

## **SAN JOAQUIN RIVER REGION**

### **Recreation-Related Spending**

Under the No-Action Alternative, total spending associated with use of recreation areas in the San Joaquin River Region is projected to be approximately \$84 million (Table III-4). Reservoir activities account for 65 percent of the total regional recreation spending. Recreation use at rivers and wildlife refuges accounts for about 35 percent of the total spending.

**TABLE III-2**

**ANNUAL REGIONAL RECREATION-RELATED EXPENDITURES OF VISITORS**

Region	No-Action Alternative	Changes Compared to No-Action Alternative			
		Alternative 1	Alternative 2	Alternative 3	Alternative 4
Sacramento River	54,238	312	838	838	838
San Joaquin River	22,909	294	688	1,050	1,050
Tulare Lake	34	0	52	52	52

NOTES:  
 All values are expressed in thousands of 1992 dollars.  
 Changes in regional recreation-related expenditures by visitors also would occur in other regions as a result of anadromous fishery enhancement. Refer to Attachment A, "Effects of Improvements in Anadromous Fisheries," for a discussion of regional expenditure impacts associated with the fishery enhancement scenarios.

**TABLE III-3**

**ANNUAL RECREATION BENEFITS AT KEY RECREATION AREAS  
IN THE SACRAMENTO RIVER REGION**

Recreation Area	No-Action Alternative	Changes Compared to No-Action Alternative			
		Alternative 1	Alternative 2	Alternative 3	Alternative 4
<b>Lakes</b>					
Shasta	154,472	0*	0*	0*	0*
Oroville	17,981	0*	0*	0*	0*
Folsom	36,667	0*	0*	0*	0*
<b>Subtotal</b>	<b>209,120</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Wildlife Refuges	2,092	527	1,386	1,386	1,386
<b>Total</b>	<b>211,212</b>	<b>527</b>	<b>1,386</b>	<b>1,386</b>	<b>1,386</b>
<p><b>NOTES:</b>                      All values are expressed in thousands of 1992 dollars.</p> <p>The term "0*" denotes a change of less than 3 percent compared to the value associated with the No-Action Alternative. These changes are considered within the margin of error of the models and consequently are treated as zeros.</p> <p>Because of model limitations, wildlife refuge values should be interpreted as indicators of potential changes.</p> <p>Values associated with changes to sport fishing in rivers of the region are described in Attachment A, "Effects of Improvements in Anadromous Fisheries."</p>					

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Environmental Consequences

**TABLE III-4**  
**ANNUAL RECREATION TRIP-RELATED EXPENDITURES AT KEY RECREATION AREAS**  
**IN THE SAN JOAQUIN RIVER REGION**

Recreation Area	No-Action Alternative	Changes Compared to No-Action Alternative			
		Alternative 1	Alternative 2	Alternative 3	Alternative 4
<b>Reservoirs and Lakes</b>					
San Luis	4,142	0*	0*	0*	0*
Millerton	10,454	0*	0*	0*	0*
New Melones	12,306	0*	0*	0*	0*
Non-CVP reservoirs (1)	28,254	0*	0*	0*	0*
<b>Subtotal</b>	<b>55,156</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Rivers (2)</b>					
San Joaquin	11,712	0*	0*	0*	0*
Stanislaus	6,646	0*	0*	447	447
Non-CVP rivers (3)	9,089	0*	0*	379	379
<b>Subtotal</b>	<b>27,447</b>	<b>0</b>	<b>0</b>	<b>826</b>	<b>826</b>
Wildlife Refuges	1,891	662	1,547	1,547	1,547
<b>Total</b>	<b>84,494</b>	<b>662</b>	<b>1,547</b>	<b>2,373</b>	<b>2,373</b>
NOTES:					
All values are expressed in thousands of 1992 dollars.					
The term "0*" denotes a change of less than 3 percent compared to the value associated with the No-Action Alternative. These changes are considered within the margin of error of the models and consequently are treated as zeros.					
Because of model limitations, wildlife refuge values should be interpreted as indicators of potential changes.					
(1)	Includes Lake McClure, New Don Pedro Reservoir, New Hogan Lake, and Camanche Reservoir.				
(2)	Includes fishing, boating, swimming, and wildlife viewing activities only.				
(3)	Includes the Merced and Tuolumne rivers.				

**Recreation Benefits**

The benefits of recreation activity at affected reservoirs and lakes in the San Joaquin River Region are estimated to average approximately \$33.1 million annually under the No-Action Alternative (Table III-5).

The benefits of recreation activity at affected rivers in the San Joaquin River Region are estimated to average approximately \$21.5 million annually under the No-Action Alternative.

The benefits of recreation activity at state and federal wildlife refuges in the San Joaquin River Region are estimated to average approximately \$1.5 million annually under the No-Action Alternative.

Total recreation benefits at affected facilities in the San Joaquin River Region are estimated to average approximately \$56.1 million annually, with affected reservoirs accounting for about 59 percent of this value.

**TULARE LAKE REGION**

Study area recreation sites in the Tulare Lake Region include Kern and Pixley NWRs. Total recreation-related expenditures associated with use of these refuges are projected to be \$77,000 under the No-Action Alternative. Recreation benefits associated with use of these refuges are estimated to total \$79,200.

Substantial waterfowl hunting on private lands also occurs in the Tulare Lake Region. No estimates are available on the level of this activity under the No-Action Alternative.

**SAN FRANCISCO BAY/SACRAMENTO-SAN JOAQUIN DELTA REGION**

Impacts on sport-fishing values in the San Joaquin River portion of the Delta are included as part of the analysis of the San Joaquin River, discussed in the "San Joaquin River Region" section. Impacts on sport-fishing values in the San Francisco Bay are included as part of the analysis of the San Francisco Subregion of the Pacific Coast Region, discussed in Attachment A, "Effects of Improvements in Anadromous Fisheries."

Sport-fishing values in the Sacramento River portion of the Delta are based on the average 1967-1991 historical conditions for the Sacramento-San Joaquin River fishery. These values are reported in Attachment A.

**PACIFIC COAST REGION**

Ocean sport and commercial salmon fishery conditions under the No-Action Alternative are based on the average 1967-1991 historical conditions for the Sacramento-San Joaquin River fishery. Economic values associated with these conditions are reported in Attachment A.

TABLE III-5

ANNUAL RECREATION BENEFITS AT KEY RECREATION AREAS  
IN THE SAN JOAQUIN RIVER REGION

Recreation Area	No-Action Alternative	Changes Compared to No-Action Alternative			
		Alternative 1	Alternative 2	Alternative 3	Alternative 4
Reservoirs and Lakes					
San Luis	1,768	0*	0*	0*	0*
Millerton	6,361	0*	0*	0*	0*
New Melones	7,676	0*	0*	0*	0*
Non-CVP reservoirs (1)	17,274	0*	0*	0*	0*
<b>Subtotal</b>	<b>33,079</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Rivers (2)					
San Joaquin	9,362	0*	0*	0*	0*
Stanislaus	5,100	0*	0*	337	337
Non-CVP rivers (3)	7,009	0*	0*	288	288
<b>Subtotal</b>	<b>21,471</b>	<b>0</b>	<b>0</b>	<b>625</b>	<b>625</b>
Wildlife Refuges	1,507	463	1,091	1,091	1,091
<b>Total</b>	<b>56,057</b>	<b>463</b>	<b>1,091</b>	<b>1,716</b>	<b>1,716</b>

NOTES:

All values are expressed in thousands of 1992 dollars.

The term "0\*" denotes a change of less than 3 percent compared to the value associated with the No-Action Alternative. These changes are considered within the margin of error of the models and consequently are treated as zeros.

Because of model limitations, wildlife refuge values should be interpreted as indicators of potential changes.

(1) Includes Lake McClure, New Don Pedro Reservoir, New Hogan Lake, and Camanche Reservoir.

(2) Includes fishing, boating, swimming, and wildlife viewing activities only.

(3) Includes the Merced and Tuolumne rivers.

**ALTERNATIVE 1****SACRAMENTO RIVER REGION**

As described earlier under "Analysis Methodology", changes in recreation-related expenditures relate only to the expenditures of recreationists within the region of interest, while recreation benefits represent the entire benefit experienced by recreationists at each facility.

**Recreation-Related Spending**

Under Alternative 1, annual spending associated with use of Sacramento River Region reservoirs and lakes would not change relative to spending under the No-Action Alternative (Table III-1). As described in the Recreation Technical Appendix, a slight decrease in recreation use is estimated; however, because the magnitude of this change is very small (less than 2 percent at all reservoirs) and within the margin of error of the estimation approach, no change in recreation-related spending associated with reservoir visitation is predicted.

Spending associated with use of Sacramento River Region wildlife refuges would increase by an estimated \$848,000 (Table III-1). Spending associated with waterfowl hunting opportunities on private lands would be unchanged compared with spending under the No-Action Alternative.

Potential changes in recreation-related spending associated with sport fishing on affected rivers in the Sacramento River Region are discussed in Attachment A, "Effects of Improvements in Anadromous Fisheries". The information presented in Attachment A, however, is not specifically related to any of the action alternatives.

Total recreation-related spending by visitors to the region is projected to increase by \$312,000 under Alternative 1 (Table III-2).

In summary, total recreation-related spending in the Sacramento River Region under Alternative 1 would be expected to increase slightly compared with spending under the No-Action Alternative, primarily because of improved conditions at the wildlife refuges. Expected enhancements to river fisheries, although not quantified here, are expected to contribute to increases in recreation-related spending. These increases could be somewhat offset by minor reductions in reservoir-related spending. Overall spending by visitors would be expected to increase slightly.

From a regional perspective, changes in regional economic activity would be minor. However, businesses serving recreationists near key recreation areas could experience some noticeable change in sales to recreationists. Businesses serving river anglers for anadromous fish and visitors to wildlife refuges could experience an increase in sales, whereas businesses near affected reservoirs may experience a relatively small decrease in sales.

**Recreation Benefits**

The annual benefits of recreation activity at affected reservoirs and lakes in the Sacramento River Region are not expected to change under Alternative 1 compared with benefits under the

Spending” section, the magnitude of change in use (which determines recreation benefits) is very small and within the margin of error of the estimation approach; consequently, no change in recreation benefits is predicted.

The benefits of recreation activity at state and federal wildlife refuges in the Sacramento River Region are estimated to increase by approximately \$527,000 under Alternative 1, or about 25 percent compared with benefits under the No-Action Alternative. Recreation benefits associated with waterfowl hunting on private lands are expected to be unchanged compared with those under the No-Action Alternative.

Potential changes in recreation benefits associated with sport fishing on affected rivers in the Sacramento River Region are discussed in Attachment A, “Effects of Improvements in Anadromous Fisheries”.

## **SAN JOAQUIN RIVER REGION**

### **Recreation-Related Spending**

Under Alternative 1, spending associated with use of reservoirs in the San Joaquin River Region would not be expected to change. As described in the Recreation Technical Appendix, a slight decrease in recreation use is estimated; however, because the magnitude of this change is very small (less than 2 percent at all reservoirs) and within the margin of error of the estimation approach, no change in recreation-related spending associated with reservoir visitation is predicted.

Spending associated with regional wildlife refuge use would increase by an estimated \$662,000 (Table III-4). Spending associated with use at affected rivers in the San Joaquin River Region would not change appreciably relative to spending under the No-Action Alternative.

Total recreation-related spending by visitors to the region is projected to increase by \$294,000 under Alternative 1 (Table III-2).

In summary, total recreation-related spending in the San Joaquin River Region under Alternative 1 would be expected to increase slightly compared with such spending under the No-Action Alternative, primarily because of improved conditions at the wildlife refuges and secondarily because of slight improvements at affected rivers in the region. This increase could be somewhat offset by minor reductions in reservoir-related spending. Overall spending by visitors would be expected to increase slightly.

From a regional perspective, changes in economic activity would be minor. However, businesses serving recreationists near key recreation areas could experience some noticeable change in sales to recreationists. Businesses serving visitors to wildlife refuges could experience an increase in sales, whereas businesses near affected reservoirs may experience a relatively small decrease in sales.

## Recreation Benefits

Under Alternative 1, recreation benefits associated with use of reservoirs and rivers in the region would not change. As explained previously in the "Recreation-Related Spending" section, the magnitude of change in use (which determines recreation benefits) is very small and within the margin of error of the estimation approach; consequently, no change in recreation benefits is predicted.

Benefits associated with use at regional wildlife refuges would increase by an estimated \$463,000 (Table III-5).

## TULARE LAKE REGION

No change in spending and recreation benefits associated with use of Tulare Lake Region wildlife refuges is projected under Alternative 1.

Recreation-related spending and benefits associated with waterfowl hunting on private lands are expected to be unchanged compared with spending and benefits under the No-Action Alternative.

Local and regional economic effects caused by changes in recreation use of key areas within the region are expected to be minor.

## SAN FRANCISCO BAY/SACRAMENTO-SAN JOAQUIN DELTA REGION

Potential changes in sport-fishing values associated with three fish harvest improvement scenarios are discussed in Attachment A, "Effects of Improvements in Anadromous Fisheries." The information presented in Attachment A, however, is not specifically related to any of the action alternatives.

## PACIFIC COAST REGION

Potential changes in sport-fishing and commercial fishing values associated with three fish harvest improvement scenarios are discussed in Attachment A, "Effects of Improvements in Anadromous Fisheries". The information presented in Attachment A, however, is not specifically related to any of the action alternatives.

## ALTERNATIVE 1i

Under this alternative, the gates at Lake Red Bluff would be raised year-round, which would permanently drain the lake and reestablish a free-flowing Sacramento River during the peak recreation season. This action would affect opportunities for flatwater recreation and could affect the local economy.

Flatwater recreation opportunities for boating, water skiing, jet skiing, and swimming that normally occur during the summer would be affected. Two boat ramps operated by the City of Red Bluff and a water ski course would become unusable if the gates were permanently raised.

Camping near Lake Red Bluff could also be affected, although most camping near the lake is associated with fishing on the Sacramento River (Guthrie, pers. comm.).

The annual boat drag races during the Memorial Day weekend would be canceled if the gates were permanently raised. Visitor spending, which accounts for an estimated \$500,000 to \$750,000 in expenditures at local restaurants, motels, and other miscellaneous retail establishments in the City of Red Bluff (Yingling, pers. comm.), would be affected.

The squawfish derby would also be affected. Specific impacts on the event are difficult to estimate because most of the fishing associated with the event occurs on the river below the gates. However, some reduction in fishing would be likely.

In summary, the permanent raising of the gates at Lake Red Bluff would eliminate opportunities for flatwater recreation and would have an adverse impact on the local economy of Red Bluff. This impact includes reducing local visitor spending associated with both special events and ongoing recreation. The magnitude of this impact would depend on whether current visitors continue to visit and spend recreation-related dollars in Red Bluff. In addition, local residents who currently purchase recreation-related goods and services locally may travel elsewhere (e.g., Black Butte Reservoir, Whiskeytown Lake) for flatwater recreation opportunities and consequently not spend as much in the local economy.

Although permanent raising of the gates at Lake Red Bluff would have adverse impacts on the local economy of Red Bluff, economic impacts within the Sacramento River Region caused by raising of the gates would be small. Most of the users (i.e., 80 percent) of Lake Red Bluff are residents of the Sacramento River Region and would likely shift their existing spending on Lake Red Bluff-related activities to other activities within the region, and changes in related economic activity generated by this spending would likely be small.

Additionally, improvements to freshwater fishing in the Sacramento River could offset a portion of the loss of recreational activity in the Red Bluff area associated with the raising of the gates at Lake Red Bluff. Regional increases in spending associated with sport fishing on affected rivers in the Sacramento River Region are discussed in Attachment A, "Effects of Improvements in Anadromous Fisheries".

## **ALTERNATIVE 2**

### **SACRAMENTO RIVER REGION**

#### **Recreation-Related Spending**

Under Alternative 2, recreation-related spending associated with use of Sacramento River Region reservoirs and lakes would not change (Table III-1). As described in the Recreation Technical Appendix, a slight decrease in recreation use was estimated; however, because the magnitude of this change is very small (less than 2 percent at all reservoirs) and within the margin of error of the estimation approach, no change in recreation-related spending associated with reservoir visitation is predicted.

Spending associated with use at wildlife refuges would increase by an estimated \$2.2 million. Spending associated with waterfowl hunting opportunities on private lands is expected to be unchanged compared with such spending under the No-Action Alternative.

Potential changes in spending associated with use of affected rivers under three fish harvest improvement scenarios are discussed in Attachment A, "Effects of Improvements in Anadromous Fisheries". The information presented in Attachment A, however, is not specifically related to any of the action alternatives.

Total recreation-related spending by visitors to the region is projected to increase by \$838,000 under Alternative 2 (Table III-2).

In summary, total recreation-related spending in the Sacramento River Region under Alternative 2 would be expected to increase slightly compared with spending under the No-Action Alternative, primarily because of improved conditions at the wildlife refuges. Expected enhancements to river fisheries, although not quantified here, are expected to contribute to increases in recreation-related spending. These increases could be somewhat offset by minor reductions in reservoir-related spending. Overall spending by visitors would be expected to increase slightly.

From a regional perspective, changes in economic activity would be minor. However, businesses serving recreationists near key recreation areas could experience some noticeable change in sales to recreationists. Businesses serving river anglers for anadromous fish and visitors to wildlife refuges could experience an increase in sales, whereas businesses near affected reservoirs may experience a relatively small decrease in sales.

### **Recreation Benefits**

The annual benefits of recreation activity at affected reservoirs and lakes in the Sacramento River Region are not expected to change compared with benefits under the No-Action Alternative (Table III-3). As explained previously in the "Recreation-Related Spending" section, the magnitude of change in use (which determines recreation benefits) is very small and within the margin of error of the estimation approach; consequently, no change in recreation benefits is predicted.

The benefits of recreation activity at state and federal wildlife refuges in the Sacramento River Region are estimated to increase by approximately \$1.4 million under Alternative 2, or about 66 percent, compared with such benefits under the No-Action Alternative. Recreation benefits associated with waterfowl hunting on private lands are expected to be unchanged compared with such benefits under the No-Action Alternative.

Potential changes in recreation benefits associated with sport fishing on affected rivers in the Sacramento River Region under three fish harvest improvement scenarios are discussed in Attachment A, "Effects of Improvements in Anadromous Fisheries". The information presented in Attachment A, however, is not specifically related to any of the action alternatives.

## SAN JOAQUIN RIVER REGION

### Recreation-Related Spending

Under Alternative 2, recreation-related spending associated with use at affected reservoirs and rivers in the San Joaquin River Region would not be expected to change (Table III-4). As described in the Recreation Technical Appendix, a slight decrease in recreation use was estimated; however, because the magnitude of this change is very small (less than 2 percent at all reservoirs) and within the margin of error of the estimation approach, no change in recreation-related spending associated with reservoir visitation is predicted.

Recreation-related spending would increase by approximately \$1.5 million at the region's wildlife refuges.

Total recreation-related spending by visitors to the region is projected to increase by \$688,000 under Alternative 2 (Table III-2).

In summary, total recreation-related spending in the San Joaquin River Region under Alternative 2 would be expected to increase slightly compared with spending under the No-Action Alternative, primarily because of improved conditions at the wildlife refuges and secondarily because of slight improvements at affected rivers in the region. This increase could be somewhat offset by reductions in reservoir-related spending. Overall spending by visitors would be expected to increase slightly.

From a regional perspective, changes in economic activity would be minor. However, businesses serving recreationists near key recreation areas could experience some noticeable change in sales to recreationists. Businesses serving visitors to wildlife refuges and some rivers could experience an increase in sales, whereas businesses near affected reservoirs may experience a relatively small decrease in sales.

### Recreation Benefits

The annual benefits of recreation activity at affected reservoirs and rivers in the San Joaquin River Region are not expected to change compared with benefits under the No-Action Alternative (Table III-5). As explained previously in the "Recreation-Related Spending" section, the magnitude of change in use (which determines recreation benefits) is very small and within the margin of error of the estimation approach; consequently, no change in recreation benefits is predicted.

The benefits of recreation activity at state and federal wildlife refuges in the San Joaquin River Region are estimated to increase by approximately \$1.1 million under Alternative 2, or about 72 percent, compared with such benefits under the No-Action Alternative. Recreation benefits associated with waterfowl hunting on private lands are expected to be unchanged compared with benefits under the No-Action Alternative.

Annual recreation benefits at all affected recreation areas in the San Joaquin River Region are estimated to increase by \$1.1 million.

**TULARE LAKE REGION**

Spending associated with use of Tulare Lake Region wildlife refuges would increase by an estimated \$116,000 under Alternative 2. Recreation benefits are estimated to increase by \$119,000.

Recreation-related spending and benefits associated with waterfowl hunting on private lands are expected to be unchanged compared with spending and benefits under the No-Action Alternative.

Total recreation-related spending by visitors to the region is projected to increase by \$52,000 under Alternative 2 (Table III-2).

Local and regional economic effects caused by changes in recreation use of key areas in the region are expected to be minor.

**SAN FRANCISCO BAY/SACRAMENTO-SAN JOAQUIN DELTA REGION**

Potential changes in sport-fishing values fishing associated with three fish harvest improvement scenarios are discussed in Attachment A, "Effects of Improvements in Anadromous Fisheries". The information presented in Attachment A, however, is not specifically related to any of the action alternatives.

**PACIFIC COAST REGION**

Potential changes in sport-fishing and commercial fishing values associated with three fish harvest improvement scenarios are discussed in Attachment A, "Effects of Improvements in Anadromous Fisheries". The information presented in Attachment A, however, is not specifically related to any of the action alternatives.

**ALTERNATIVE 3****SACRAMENTO RIVER REGION****Recreation-Related Spending**

Under Alternative 3, spending associated with use of Sacramento River Region reservoirs would not change (Table III-1). As described in the Recreation Technical Appendix, a slight decrease in recreation use was estimated; however, because the magnitude of this change is very small (less than 2 percent at all reservoirs) and within the margin of error of the estimation approach, no change in recreation-related spending associated with reservoir visitation is predicted.

Spending associated with use of regional wildlife refuges is projected to increase by an estimated \$2.2 million. Spending associated with waterfowl hunting opportunities on private lands is expected to be unchanged compared with spending under the No-Action Alternative.

Potential changes in spending associated with use of affected rivers under three fish harvest improvement scenarios are discussed in Attachment A, "Effects of Improvements in Anadromous Fisheries." The information presented in Attachment A, however, is not specifically related to any of the action alternatives.

Total recreation-related spending by visitors to the region is projected to increase by \$838,000 under Alternative 3 (Table III-2).

In summary, total recreation-related spending in the Sacramento River Region under Alternative 3 would be expected to increase slightly compared with spending under the No-Action Alternative, primarily because of improved conditions at the wildlife refuges. Expected enhancements to river fisheries, although not quantified here, are expected to contribute to increases in recreation-related spending. These increases could be somewhat offset by minor reductions in reservoir-related spending. Overall spending by visitors would be expected to increase slightly.

From a regional perspective, changes in economic activity would be minor. However, businesses serving recreationists near key recreation areas could experience some noticeable change in sales to recreationists. Businesses serving river anglers for anadromous fish and visitors to wildlife refuges could experience an increase in sales, whereas businesses near affected reservoirs may experience a relatively small decrease in sales.

### **Recreation Benefits**

The annual benefits of recreation activity at affected reservoirs and lakes in the Sacramento River Region would not change compared with benefits under the No-Action Alternative (Table III-3). As explained previously in the "Recreation-Related Spending" section, the magnitude of change in use (which determines recreation benefits) is very small and within the margin of error of the estimation approach; consequently, no change in recreation benefits is predicted.

The benefits of recreation activity at state and federal wildlife refuges in the Sacramento River Region are estimated to increase by approximately \$1.4 million under Alternative 3, or approximately 66 percent, compared with benefits under the No-Action Alternative. Recreation benefits associated with waterfowl hunting on private lands are expected to be unchanged compared with such benefits under the No-Action Alternative.

Potential changes in recreation benefits associated with sport fishing on affected rivers in the Sacramento River Region under three fish harvest improvement scenarios are discussed in Attachment A, "Effects of Improvements in Anadromous Fisheries." The information presented in Attachment A, however, is not specifically related to any of the action alternatives.

## **SAN JOAQUIN RIVER REGION**

### **Recreation-Related Spending**

Spending at affected reservoirs in the San Joaquin River Region would not change compared with spending under the No-Action Alternative (Table III-4). As described in the Recreation Technical Appendix, a slight decrease in recreation use was estimated; however, because the magnitude of

this change is very small (less than 2 percent at all reservoirs) and within the margin of error of the estimation approach, no change in recreation-related spending associated with reservoir visitation is predicted.

Spending related to recreation use at the Merced, Tuolumne, and Stanislaus rivers would increase by \$826,000. The largest spending impact in the San Joaquin River Region under this alternative would consist of an estimated \$1.5 million increase for the wildlife refuges (Table III-4). Spending associated with waterfowl hunting opportunities on private lands is expected to be unchanged compared with spending under the No-Action Alternative.

Total recreation-related spending by visitors to the region is projected to increase by \$1.1 million under Alternative 3 (Table III-2).

In summary, total recreation-related spending in the San Joaquin River Region under Alternative 3 would be expected to increase slightly compared with spending under the No-Action Alternative, primarily because of improved conditions at the wildlife refuges and at rivers in the region. This increase could be somewhat offset by minor reductions in reservoir-related spending. Overall spending by visitors would be expected to increase slightly.

From a regional perspective, changes in economic activity would be minor. However, businesses serving recreationists near key recreation areas could experience some noticeable change in sales to recreationists. Businesses serving visitors to wildlife refuges and rivers in the region could experience an increase in sales, whereas businesses near affected reservoirs may experience a relatively small decrease in sales.

### **Recreation Benefits**

The annual benefits of recreation activity at affected reservoirs and lakes in the San Joaquin River Region are not expected to change compared with benefits under the No-Action Alternative (Table III-5). As explained previously in the "Recreation-Related Spending" section, the magnitude of change in use (which determines recreation benefits) is very small and within the margin of error of the estimation approach; consequently, no change in recreation benefits is predicted.

The annual benefits of recreation activity at affected rivers in the San Joaquin River Region are estimated to increase by approximately \$625,000 under Alternative 3 (Table III-5). This change represents a 5 percent increase in recreation benefits compared with benefits under the No-Action Alternative.

The benefits of recreation activity at state and federal wildlife refuges in the San Joaquin River Region are estimated to increase by approximately \$1.1 million under Alternative 3, or about 72 percent, compared with benefits under the No-Action Alternative. Recreation benefits associated with waterfowl hunting on private lands are expected to be unchanged compared with such benefits under the No-Action Alternative.

Annual recreation benefits at all affected recreation areas in the San Joaquin River Region are estimated to increase by \$1.7 million.

## **TULARE LAKE REGION**

Spending associated with use of Kern and Pixley NWRs would increase by \$116,000. Recreation benefits are estimated to increase by \$119,000.

Spending and recreation benefits associated with waterfowl hunting opportunities on private lands are expected to be unchanged compared with spending and benefits under the No-Action Alternative.

Total recreation-related spending by visitors to the Tulare Lake Region is projected to increase by \$52,000 under Alternative 3 (Table III-2).

Local and regional economic effects associated with changes in use of key recreational areas in the region are expected to be minor.

## **SAN FRANCISCO BAY/SACRAMENTO-SAN JOAQUIN DELTA REGION**

Potential changes in sport-fishing values associated with three fish harvest improvement scenarios are discussed in Attachment A, "Effects of Improvements in Anadromous Fisheries." The information presented in Attachment A, however, is not specifically related to any of the action alternatives.

## **PACIFIC COAST REGION**

Potential changes in sport-fishing and commercial fishing values associated with three fish harvest improvement scenarios are discussed in Attachment A, "Effects of Improvements in Anadromous Fisheries." The information presented in Attachment A, however, is not specifically related to any of the action alternatives.

## **ALTERNATIVE 4**

### **SACRAMENTO RIVER REGION**

#### **Recreation-Related Spending**

Under Alternative 4, spending associated with use of Sacramento River Region reservoirs would not be expected to change (Table III-1). As described in the Recreation Technical Appendix, a slight decrease in recreation use was estimated; however, because the magnitude of this change is very small (less than 2 percent at all reservoirs) and within the margin of error of the estimation approach, no change in recreation-related spending associated with reservoir visitation is predicted.

Spending would increase by an estimated \$2.2 million at the region's wildlife refuges (Table III-1). Spending associated with waterfowl hunting opportunities on private lands is expected to be unchanged compared with spending under the No-Action Alternative.

Potential changes in spending associated with use of affected rivers under three fish harvest improvement scenarios are discussed in Attachment A, "Effects of Improvements in Anadromous Fisheries". The information presented in Attachment A, however, is not specifically related to any of the action alternatives.

Total recreation-related spending by visitors to the region is projected to increase by \$838,000 under Alternative 4 (Table III-2).

In summary, total recreation-related spending in the Sacramento River Region under Alternative 4 would be expected to increase slightly compared with spending under the No-Action Alternative, primarily because of improved conditions at the wildlife refuges. Expected enhancements to river fisheries, although not quantified here, are expected to contribute to increases in recreation-related spending. These increases could be somewhat offset by minor reductions in reservoir-related spending. Overall spending by visitors would be expected to increase slightly.

From a regional perspective, changes in economic activity would be minor. However, businesses serving recreationists near key recreation areas could experience some noticeable change in sales to recreationists. Businesses serving river anglers for anadromous fish and visitors to wildlife refuges could experience an increase in sales, whereas businesses near affected reservoirs may experience a relatively small decrease in sales.

### **Recreation Benefits**

The annual benefits of recreation activity at affected reservoirs and lakes in the Sacramento River Region are not expected to change compared with benefits under the No-Action Alternative (Table III-3). As explained above in the "Recreation-Related Spending" section, the magnitude of change in use (which determines recreation benefits) is very small and within the margin of error of the estimation approach; consequently, no change in recreation benefits is predicted.

The benefits of recreation activity at state and federal wildlife refuges in the Sacramento River Region are estimated to increase by approximately \$1.4 million under Alternative 4, or about 66 percent, compared with benefits under the No-Action Alternative. Recreation benefits associated with waterfowl hunting on private lands are expected to be unchanged compared with such benefits under the No-Action Alternative.

Potential changes in recreation benefits associated with sport fishing on affected rivers in the Sacramento River Region under three fish harvest improvement scenarios are discussed in Attachment A, "Effects of Improvements in Anadromous Fisheries". The information presented in Attachment A, however, is not specifically related to any of the action alternatives.

## SAN JOAQUIN RIVER REGION

### Recreation-Related Spending

Overall spending at San Joaquin River Region reservoirs and lakes is not expected to change compared with spending under the No-Action Alternative (Table III-4). As described in the Recreation Technical Appendix, a slight decrease in recreation use was estimated; however, because the magnitude of this change is very small (less than 2 percent at all reservoirs) and within the margin of error of the estimation approach, no change in recreation-related spending associated with reservoir visitation is predicted.

Increases in spending associated with use of the region's rivers would be the same as under Alternative 3 (\$826,000).

Wildlife refuge-related spending would increase by \$1.5 million. Spending associated with waterfowl hunting opportunities on private lands is expected to be unchanged compared with spending under the No-Action Alternative.

Total recreation-related spending by visitors to the region is projected to increase by \$1.1 million under Alternative 4 (Table III-2).

In summary, total recreation-related spending in the San Joaquin River Region under Alternative 4 would be expected to increase slightly compared with spending under the No-Action Alternative, primarily because of improved conditions at the wildlife refuges and at rivers in the region. This increase could be somewhat offset by minor reductions in reservoir-related spending. Overall spending by visitors would be expected to increase slightly.

From a regional perspective, changes in economic activity would be minor. However, businesses serving recreationists near key recreation areas could experience some noticeable change in sales to recreationists. Businesses serving visitors to wildlife refuges and rivers in the region could experience an increase in sales, whereas businesses near affected reservoirs may experience a relatively small decrease in sales.

### Recreation Benefits

The annual benefits of recreation activity at affected reservoirs and lakes in the San Joaquin River Region would not be expected to change compared with benefits under the No-Action Alternative (Table III-5).

The annual benefits of recreation activity at affected rivers in the San Joaquin River Region are estimated to increase by approximately \$625,000 under Alternative 4 (Table III-5). This change represents a 5 percent increase in recreation benefits compared with benefits under the No-Action Alternative.

The benefits of recreation activity at state and federal wildlife refuges in the San Joaquin River Region are estimated to increase by approximately \$1.1 million under Alternative 4, or by about 72 percent, compared with benefits under the No-Action Alternative. Recreation benefits

associated with waterfowl hunting on private lands are expected to be unchanged compared with such benefits under the No-Action Alternative.

Total recreation benefits at all affected recreation areas in the San Joaquin River Region are estimated to increase by \$1.7 million annually.

### **TULARE LAKE REGION**

Spending associated with use of Kern and Pixley NWRs would increase by \$116,000. Recreation benefits are estimated to increase by \$119,000.

Spending and recreation benefits associated with waterfowl hunting opportunities on private lands are expected to be unchanged compared with spending and benefits under the No-Action Alternative.

Total recreation-related spending by visitors to the region is projected to increase by \$52,000 under Alternative 4 (Table III-2).

Local and regional economic effects associated with changes in use of key recreational areas within the region are expected to be minor.

### **SAN FRANCISCO BAY/SACRAMENTO-SAN JOAQUIN DELTA REGION**

Potential changes in sport-fishing values associated with three fish harvest improvement scenarios are discussed in Attachment A, "Effects of Improvements in Anadromous Fisheries." The information presented in Attachment A, however, is not specifically related to any of the action alternatives.

### **PACIFIC COAST REGION**

Potential changes in sport-fishing and commercial fishing values associated with three fish harvest improvement scenarios are discussed in Attachment A, "Effects of Improvements in Anadromous Fisheries." The information presented in Attachment A, however, is not specifically related to any of the action alternatives.

## **OTHER ECONOMIC VALUES**

In addition to recreational and commercial harvesting values associated with enhanced fish and wildlife resources, the CVPIA can also be expected to affect the values of "nonusers" of anadromous fisheries. This type of economic value, which is often referred to as existence value, reflects the public's value of knowing that anadromous fisheries are protected at sustainable levels. Although these values have not been estimated for this analysis, previous research indicates that these values can be significant. Consequently, studies of existence values of other fishery enhancement programs with similar objectives are briefly reviewed in the Fish, Wildlife, and Recreation Economics Methodology/Modeling Technical Appendix.

**CHAPTER IV**

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**BIBLIOGRAPHY**

## Chapter IV

### BIBLIOGRAPHY

#### PRINTED SOURCES

California Department of Finance, 1993, Per Capita Personal Income, California (from 1970-1993): Washington, DC, U.S. Department of Commerce, Bureau of Economic Analysis.

California State University, Chico Foundation, 1996, Red Bluff Diversion Dam Area Recreational Use Study: Chico, CA. Prepared for The Bureau of Reclamation, Denver, CO.

Cooper, J., 1990, Demand for and Net Economic Value of Waterfowl Hunting in California's Sacramento and San Joaquin Valley Refuges: Sacramento, CA, U.S. Bureau of Reclamation.

Cooper, J., and Loomis, J., 1991, Economic Value of Wildlife Resources in the San Joaquin Valley: Hunting and Viewing Values, in Dinar, A., and Zilberman, D., eds., Economics and Management of Water and Drainage in Agriculture: Norwell, MA, Kluwer Academic Publishers.

Dettman, D.H.; Kelley, D.W.; and Mitchell, W.T., 1987, The Influence of Flow on Central Valley Salmon: Newcastle, CA, D.W. Kelley & Associates.

Gall, G.A.E., et al, n.d., Chinook Mixed Fishery Project, 1986-1987: Davis, CA, University of California.

Loomis, J., and Ise, S., 1992, Net Economic Value of Recreational Fishing on the Sacramento River in 1980, in Integrated Modeling of Drought and Global Warming: Impacts on Selected California Resources: Davis, CA, University of California, Davis, National Institute for Global Environmental Change.

Minnesota IMPLAN Group, 1993, Micro IMPLAN User's Guide, Version 91-F, Open Data File: St. Paul, MN.

Pacific Fishery Management Council, 1986, Review of 1985 Ocean Salmon Fisheries: Portland, OR.

\_\_\_\_\_, 1993a, Review of 1992 Ocean Salmon Fisheries: Portland, OR.

\_\_\_\_\_, 1993b, Historical Ocean Salmon Fishery Data for Washington, Oregon, and California: Portland, OR.

\_\_\_\_\_, 1995, Review of 1994 Ocean Salmon Fisheries: Portland, OR.

Propst, D.B.; Stynes, D.J.; Lee, J.H.; and Jackson, R.S., 1992, Development of Spending Profiles for Recreation Visitors to Corps of Engineers Projects (Technical Report R-92-4): Vicksburg, MS, U.S. Army Corps of Engineers.

Service, see U.S. Fish and Wildlife Service.

Spectrum Economics, Inc., 1991, Recreation Forecasts and Benefit Estimates for California Reservoirs: Recalibrating the California Travel Cost Model: Sacramento, CA, report to Joint Agency Recreation Committee.

Thomson, C.J., and Huppert, D.D., 1987, Results of the Bay Area Sportfishing Economic Study (NOAA-TM-NMFS-SWFC-78): La Jolla, CA, National Marine Fisheries Service.

U.S. Bureau of the Census, 1992, Statistical Abstract of the U.S.: 1992: Washington, DC.

\_\_\_\_\_, 1994, Statistical Abstract of the U.S.: 1994: Washington DC.

U.S. Bureau of Economics Analysis, 1992, Regional Economic Profile for Counties and Metropolitan Areas: Washington, DC.

\_\_\_\_\_, 1993, Regional Economic Profile for Counties and Metropolitan Areas: Washington, DC.

U.S. Fish and Wildlife Service, 1995, Central Valley Project Improvement Act Report to Congress - Report to Congress on the Central Valley Project Impacts to the Anadromous Fish Resource, Fisheries, and Associated Economic, Social, or Cultural Interests: N.p.

U.S. Fish and Wildlife Service and U.S. Bureau of the Census, 1982, 1980 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation: California: Washington, DC.

\_\_\_\_\_, 1989, 1985 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation: California: Washington, DC.

\_\_\_\_\_, 1993, 1991 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation: California: Washington, DC.

Wade, W.W.; McCollister, G.M.; McCann, R.J.; and Johns, G.M., 1987, Economic Evaluation of the Freshwater Recreation Uses of the Sacramento-San Joaquin Delta (SWC Exhibit No. 66): Palo Alto, CA, QED Research, Inc., prepared for the Metropolitan Water District of Southern California, Los Angeles, CA.

### **PERSONAL COMMUNICATIONS**

Baracco, Alan - California Department of Fish and Game, Senior Marine Biologist, 1994. Telephone conversation, February 10, 1994.

Fraser, Keith - Loch Lomond Live Bait and Tackle, Owner, 1994. Telephone conversation, January 3, 1994.

Guthrie, Roger, Ph.D. - California State University, Chico Foundation, Chico, CA, Project Director, 1996. Telephone conversation, June 5, 1996.

Meyer, Shel - Northern California Fishing Guides Association, President, 1994. Telephone conversation, January 4, 1994.

Seger, Jim - Pacific Fishery Management Council, Economist, 1995. Telephone conversation, October 18, 1995.

Yingling, John - Red Bluff-Tehama County Chamber of Commerce, Red Bluff, CA, Executive Vice President, 1996. Telephone conversation, June 5, 1996.

**ATTACHMENT A**

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**EFFECTS OF IMPROVEMENTS IN  
ANADROMOUS FISHERIES**

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## **Attachment A**

### **EFFECTS OF IMPROVEMENTS IN ANADROMOUS FISHERIES**

Because of the extensive geographical area of the Central Valley, varying data availability, and the undefined nature of many factors that affect survival in all Central Valley streams, it is not possible to project anadromous fish populations for the PEIS. However, many groups were interested in an attempt to display the benefits of increasing anadromous fish populations on sport fishing and commercial fishing.

It is recognized that a specific increase in anadromous fish populations is not necessarily directly proportional to an increase in landings. Many other factors, including climate, upwelling of the sea, technical advances for fishing, and nonrecording of landings, could affect the volume of landings recorded. It may not be possible to project landings even if outmigrant populations were projected.

To provide a perspective of potential economic changes that may be related to increased landings, three scenarios were developed for sports fishing and commercial fishing.

- 33% increase in landings in each region associated with chinook salmon from Central Valley streams
- 67% increase in landings in each region associated with chinook salmon from Central Valley streams
- 100% increase in landings in each region associated with chinook salmon from Central Valley streams

#### **SPORT FISHING**

Sport-fishing trip-related expenditures and changes in recreation benefits are presented in Tables A-1 and A-2, respectively. Overall, expenditures and recreation benefits increase with an increase in landings, as shown in Figure A-1, but the increases are not proportional to the increase in catch. The percent increase in expenditures and benefits is less than the percent change in the catch rate. This type of relationship reflects the fact that fish catch is only one factor affecting the decision to take a fishing trip.

#### **COMMERCIAL OCEAN SALMON FISHING**

Estimated average annual harvest values and net income directly generated by salmon harvests are presented in Table A-3 and Figure A-2. As with sport fishing, revenues and expenditures

TABLE A-1

## SPORT-FISHING TRIP-RELATED EXPENDITURES ASSOCIATED WITH FISHERY ENHANCEMENT SCENARIOS

Recreation Area	No-Action Alternative	33% Increase Scenario			67% Increase Scenario			100% Increase Scenario		
		Expenditures	Increase Compared to No-Action	Percent Increase	Expenditures	Increase Compared to No-Action	Percent Increase	Expenditures	Increase Compared to No-Action	Percent Increase
<b>Sacramento River Region (1)</b>										
Upper Sacramento River	1,127	1,326	199	17.7	1,498	371	32.9	1,653	526	46.7
Middle Sacramento River	3,879	4,254	375	9.7	4,566	687	17.7	4,840	961	24.8
Lower Sacramento River	4,110	4,486	376	9.2	4,794	684	16.6	5,062	952	23.2
Feather River	4,100	4,484	384	9.4	4,810	710	17.3	5,084	984	24.0
American River	4,427	4,788	361	8.2	5,095	668	15.1	5,355	928	21.0
Yuba River	1,547	1,655	108	7.0	1,746	199	12.9	1,816	269	17.4
<b>Subtotal</b>	<b>19,190</b>	<b>20,993</b>	<b>1,803</b>	<b>9.4</b>	<b>22,509</b>	<b>3,319</b>	<b>17.3</b>	<b>23,810</b>	<b>4,620</b>	<b>24.1</b>
<b>San Francisco Bay/Sacramento-San Joaquin Delta (2)</b>										
	11,193	12,224	1,031	9.2	13,095	1,902	7.1	13,853	2,660	23.8
<b>Pacific Coast Region (3)</b>										
North Coast	5,769	5,849	80	1.4	5,924	155	2.7	5,998	229	4.0
San Francisco	6,962	7,278	316	4.5	7,548	586	8.4	8,017	1,055	15.2
Central Coast	7,259	7,609	350	4.8	7,900	641	8.8	8,152	893	12.3
<b>Subtotal</b>	<b>18,990</b>	<b>20,736</b>	<b>746</b>	<b>3.7</b>	<b>21,372</b>	<b>1,382</b>	<b>6.9</b>	<b>22,167</b>	<b>2,177</b>	<b>10.9</b>
NOTES:										
All values are expressed in thousands of 1992 dollars; values associated with fishery enhancement in the San Joaquin River Region are included as part of the values reported in Table III-4.										
(1) Values reflect expenditures associated with all sport fishing.										
(2) Includes only Sacramento River portion of the Delta.										
(3) Values reflect expenditures associated only with salmon sport fishing.										

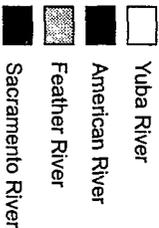
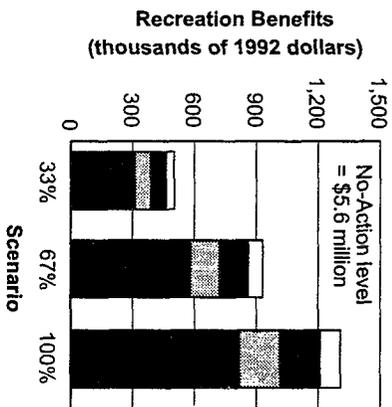
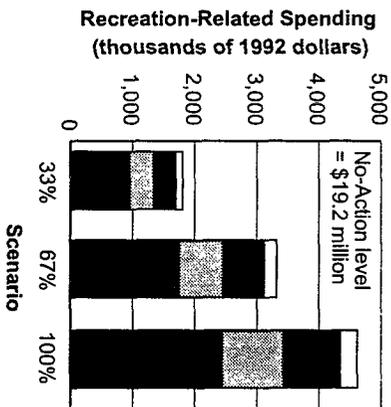
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TABLE A-2

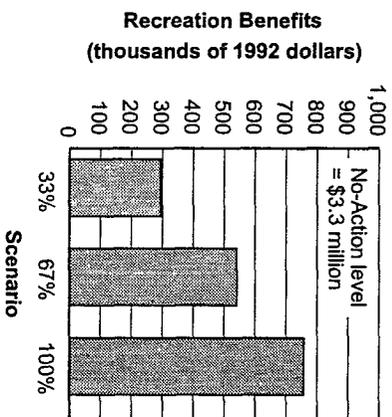
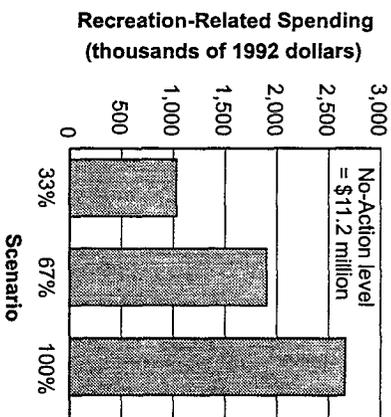
**RECREATION BENEFITS RELATED TO SPORT FISHING ASSOCIATED  
WITH FISHERY ENHANCEMENT SCENARIOS**

Recreation Area	No-Action Alternative	33% Increase Scenario			67% Increase Scenario			100% Increase Scenario		
		Benefits	Increase Compared to No-Action	Percent Increase	Benefits	Increase Compared to No-Action	Percent Increase	Benefits	Increase Compared to No-Action	Percent Increase
<b>Sacramento River Region (1)</b>										
Upper Sacramento River	666	781	115	17.3	883	217	32.3	976	310	46.6
Middle Sacramento River	1,109	1,194	85	35.7	1,266	157	14.2	1,329	220	19.8
Lower Sacramento River	1,250	1,361	111	8.9	1,455	205	16.4	1,536	286	22.9
Feather River	953	1,030	77	8.1	1,095	142	14.9	1,151	198	20.8
American River	1,012	1,088	76	7.5	1,152	140	13.8	1,208	196	19.4
Yuba River	572	610	38	6.6	642	70	12.2	669	97	17.0
<b>Subtotal</b>	<b>5,562</b>	<b>6,064</b>	<b>502</b>	<b>14.6</b>	<b>6,493</b>	<b>931</b>	<b>16.7</b>	<b>6,869</b>	<b>1,307</b>	<b>23.5</b>
<b>San Francisco Bay/Sacramento-San Joaquin Delta (2)</b>										
	3,322	3,616	294	8.9	39,863	541	16.3	4,079	757	22.8
<b>Pacific Coast Region (3)</b>										
North Coast	10,247	10,333	86	0.8	10,412	165	1.6	10,488	241	2.4
San Francisco	6,818	7,117	299	4.4	7,374	556	8.2	7,817	999	14.7
Central Coast	7,683	8,039	356	4.6	8,336	653	8.5	8,588	905	11.8
<b>Subtotal</b>	<b>24,748</b>	<b>25,489</b>	<b>741</b>	<b>3.0</b>	<b>26,122</b>	<b>1,374</b>	<b>5.5</b>	<b>26,893</b>	<b>2,145</b>	<b>8.7</b>
NOTES:										
All values are expressed in thousands of 1992 dollars.										
(1) Values reflect recreation benefits associated with all sport fishing.										
(2) Includes only Sacramento River portion of the Delta.										
(3) Values reflect recreation benefits associated only with salmon sport fishing.										

SACRAMENTO RIVER REGION



BAY-DELTA REGION

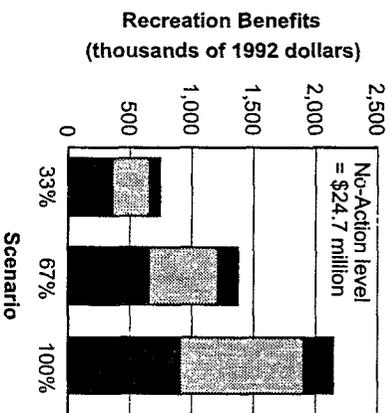
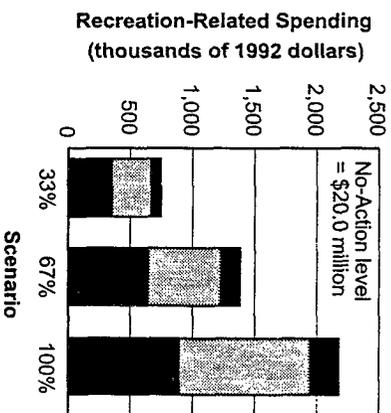


NOTES: Values are not broken down for the Bay-Delta Region.

Changes in recreation-related spending and benefits associated with rivers in the San Joaquin River Region are included in the values presented in Figure III-3.

FIGURE A-1

PACIFIC COAST REGION



EFFECTS OF FISHERY ENHANCEMENT SCENARIOS ON RECREATION-RELATED SPENDING AND BENEFITS, BY REGION

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Attachment A

**TABLE A-3**  
**SUMMARY COMPARISON OF COMMERCIAL OCEAN SALMON**  
**HARVEST EFFECTS OF FISHERIES IMPROVEMENT SCENARIOS**

Subregion	No-Action Alternative	33% Increase Scenario			67% Increase Scenario			100% Increase Scenario		
		Harvest	Increase (1)	Percentage Increase	Harvest	Increase (1)	Percentage Increase	Harvest	Increase (1)	Percentage Increase
<b>North Coast</b>										
Salmon harvest										
Salmon landed	500,793	530,720	29,927	6.0%	561,553	60,760	12.1%	591,480	90,687	18.1%
Pounds landed (1,000)	4,319	4,615	296	6.9%	4,920	602	13.9%	5,217	898	20.8%
Harvesting sector										
Ex-vessel revenue (\$1,000)	\$13,256.5	\$14,231.2	\$975	7.4%	\$15,235.5	\$1,979	14.9%	\$16,210.2	\$2,954	22.3%
Net income (\$1,000)	\$5,170.0	\$5,550.2	\$380	7.4%	\$5,941.8	\$772	14.9%	\$6,322.0	\$1,152	22.3%
<b>San Francisco</b>										
Salmon harvest										
Salmon landed	246,427	301,479	55,052	22.3%	358,200	111,772	45.4%	413,252	166,824	67.7%
Pounds landed (1,000)	2,336	2,881	545	23.3%	3,443	1,107	47.4%	3,988	1,652	70.7%
Harvesting sector										
Ex-vessel revenue (\$1,000)	\$7,532.2	\$9,325.3	\$1,793	23.8%	\$11,172.8	\$3,641	48.3%	\$12,965.9	\$5,434	72.1%
Net income (\$1,000)	\$2,952.6	\$3,655.5	\$703	23.8%	\$4,379.7	\$1,427	48.3%	\$5,082.6	\$2,130	72.1%
<b>Central Coast</b>										
Salmon harvest										
Salmon landed	100,080	128,836	28,756	28.7%	158,463	58,383	58.3%	187,219	87,139	87.1%
Pounds landed (1,000)	967	1,252	285	29.4%	1,545	578	59.8%	1,830	863	89.2%
Harvesting sector										
Ex-vessel revenue (\$1,000)	\$3,147.4	\$4,084.0	\$937	29.8%	\$5,049.0	\$1,902	60.4%	\$5,985.6	\$2,838	90.2%
Net income (\$1,000)	\$1,111.0	\$1,441.7	\$331	29.8%	\$1,782.3	\$671	60.4%	\$2,112.9	\$1,002	90.2%
NOTES:										
Revenues are presented in dollars adjusted to a 1992 base year. All effects represent estimated average annual effects.										
(1) Increase relative to No-Action Alternative.										

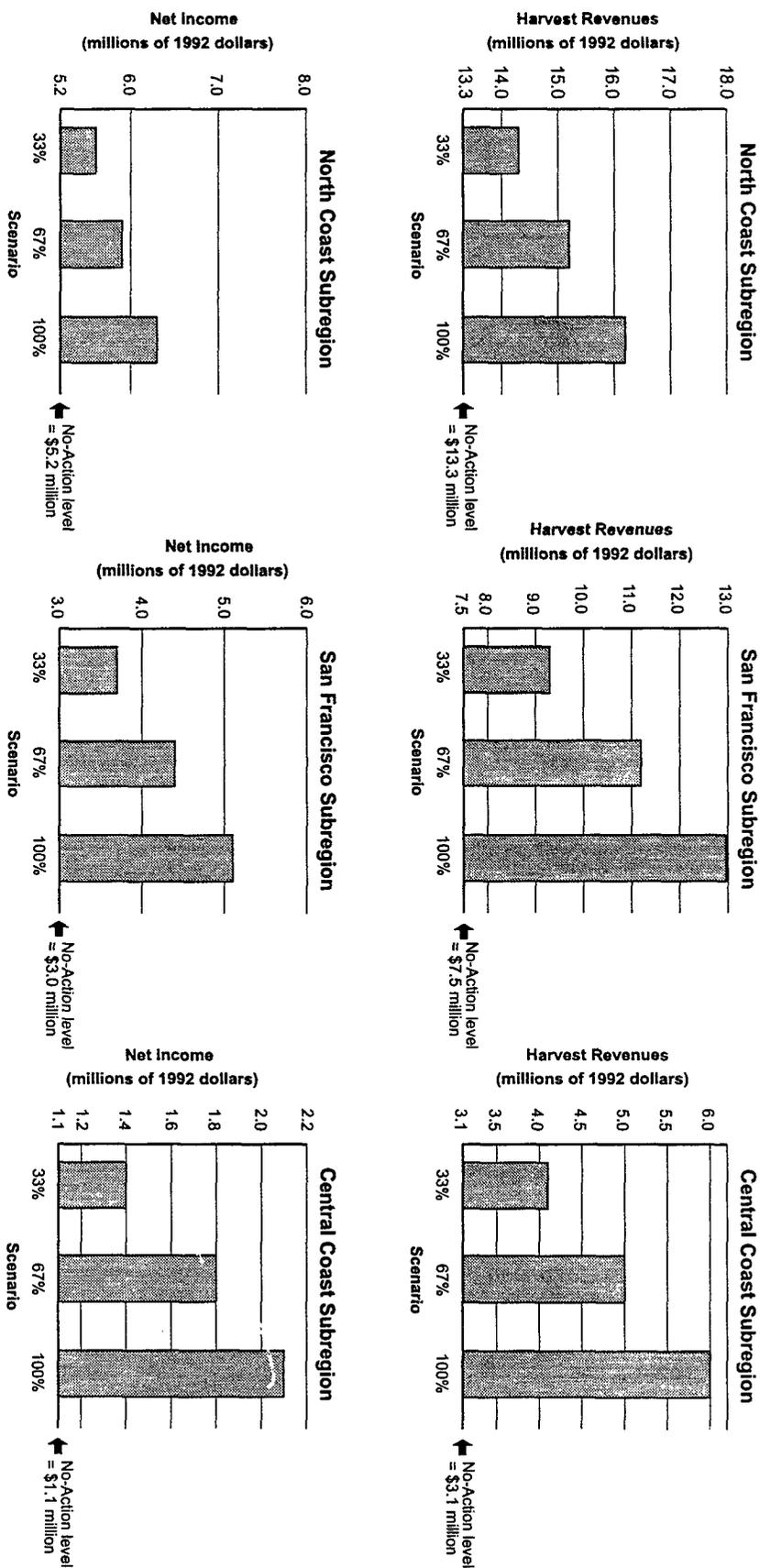


FIGURE A-2

EFFECTS OF FISHERY ENHANCEMENT SCENARIOS ON COMMERCIAL SALMON FISHING REVENUES AND NET INCOME IN THE PACIFIC COAST SUBREGIONS

would increase with landings. However, with commercial fishing, the benefits are almost directly proportional to catch rate.

One of the benefits of commercial salmon fishing to small coastal communities is the increase in sales tax. Estimates of changes in local sales tax are shown in Table A-4. The revenues in the North Coast Subregion of the Pacific Coast Region primarily would be in Del Norte, Humboldt, and Mendocino counties. In the San Francisco and Central Coast subregions, the increased sales tax would benefit San Francisco, Santa Cruz, Monterey, San Luis Obispo, and Santa Barbara counties.

TABLE A-4

**ESTIMATED LOCAL SALES TAX REVENUES DIRECTLY GENERATED BY SALMON  
HARVEST SECTOR UNDER FISHERIES IMPROVEMENT SCENARIOS**

Subregion	No-Action Alternative			33% Increase Scenario			67% Increase Scenario			100% Increase Scenario		
	Annual Harvest Revenue (\$1,000)	Annual Taxable Expenditures (1) (\$1,000)	Annual Sales Tax Revenue (2) (\$1,000)	Annual Harvest Revenue (\$1,000)	Annual Taxable Expenditures (1) (\$1,000)	Annual Sales Tax Revenue (2) (\$1,000)	Annual Harvest Revenue (\$1,000)	Annual Taxable Expenditures (1) (\$1,000)	Annual Sales Tax Revenue (2) (\$1,000)	Annual Harvest Revenue (\$1,000)	Annual Taxable Expenditures (1) (\$1,000)	Annual Sales Tax Revenue (2) (\$1,000)
North Coast	\$13,256.5	\$2,717.6	\$61.1	\$14,231.2	\$2,917.4	\$65.6	\$15,235.5	\$3,123.3	\$70.3	\$16,210.2	\$3,323.1	\$74.8
San Francisco	\$7,532.2	\$1,544.1	\$34.7	\$9,325.3	\$1,911.7	\$43.0	\$11,172.8	\$2,290.4	\$51.5	\$12,965.9	\$2,658.0	\$59.8
Central Coast	\$3,147.4	\$645.2	\$14.5	\$4,084.0	\$837.2	\$18.8	\$5,049.0	\$1,035.0	\$23.3	\$5,985.6	\$1,227.0	\$27.6

NOTES:  
Revenues and expenditures are presented in thousands of dollars adjusted to a 1992 base year.

(1) Estimated by assuming taxable expenditures by the harvesting sector equal 20.5% of annual harvest revenues.

(2) Estimated by applying the 2.25% portion of the 7.25% base sales tax rate to estimated taxable expenditures. Tax revenues represent the portion of total sales tax revenue that would be returned to local governments within each region.