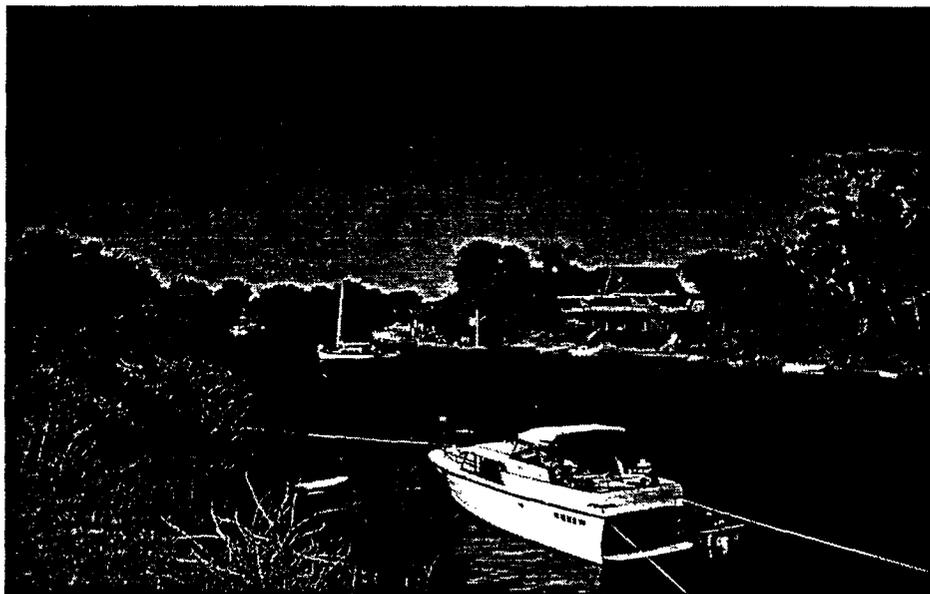


The Economic Impact of Recreational Boating and Fishing in the Delta



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The Economic Impact of Recreational Boating and Fishing in the Delta

The Delta

The Sacramento-San Joaquin Delta is an important natural resource, providing a unique habitat for wildlife, prime agricultural land, opportunities for recreational activities, and the source of water for two-thirds of California's population. Located south of Sacramento and east of the San Francisco Bay, the Delta has historically received 47 percent of the State's runoff, flowing through the Sacramento, San Joaquin, Mokelumne, Cosumnes, and Calaveras rivers. The map in Figure 1 shows the Delta's drainage area, stretching from the northern border with Oregon, to the mountains bordering the southern edges of the Central Valley.

The Delta is a flat, low-lying region of rich mineral and peat soils. Originally lush wetland surrounded by riparian woodlands, the development of the Delta to its present form began in the late 1850's with the Swamp and Overflow Land Act. This act transferred ownership of all swamp and overflow land from the federal government to the State of California. The State sold these lands, using the proceeds to fund reclamation of the swamplands. The marshes were diked and drained, creating islands for agricultural development. Today, the levees provide multiple purposes including protecting the islands from flooding, defining the channels used for commercial and recreational navigation, contributing to regional flood control, protecting upland habitat areas on the islands, and protecting Delta water quality through reduced saltwater intrusion.

The Delta was given a legal boundary in 1959 with the passage of the Delta Protection Act (Section 12220 of the Water Code). Figure 2 shows the boundaries of the legal Delta, which include the shaded primary and secondary zones.

Table 1 provides some essential information about the Delta. In 1990 the Delta area, including parts of Alameda, Contra Costa, Sacramento, San Joaquin, Solano and Yolo counties, supported a population of 410,000. The Delta extends over 738,000 acres, of which 538,000 acres are presently used for agriculture, and 64,000 acres support cities and towns.

Waterways interlace the entire area, while 1,100 miles of levees protect the islands from flooding. The Pacific Flyway passes directly over the Delta, and some of the smaller unimproved islands provide suitable habitat for birds and other wildlife. These include 230 species of birds, 45 species of mammals, 52 species of fish, 25 species of reptiles and amphibians, and 150 species of flowering plants.

Figure 1: The Drainage Basin for the Delta and the Major Water Conveyance Systems

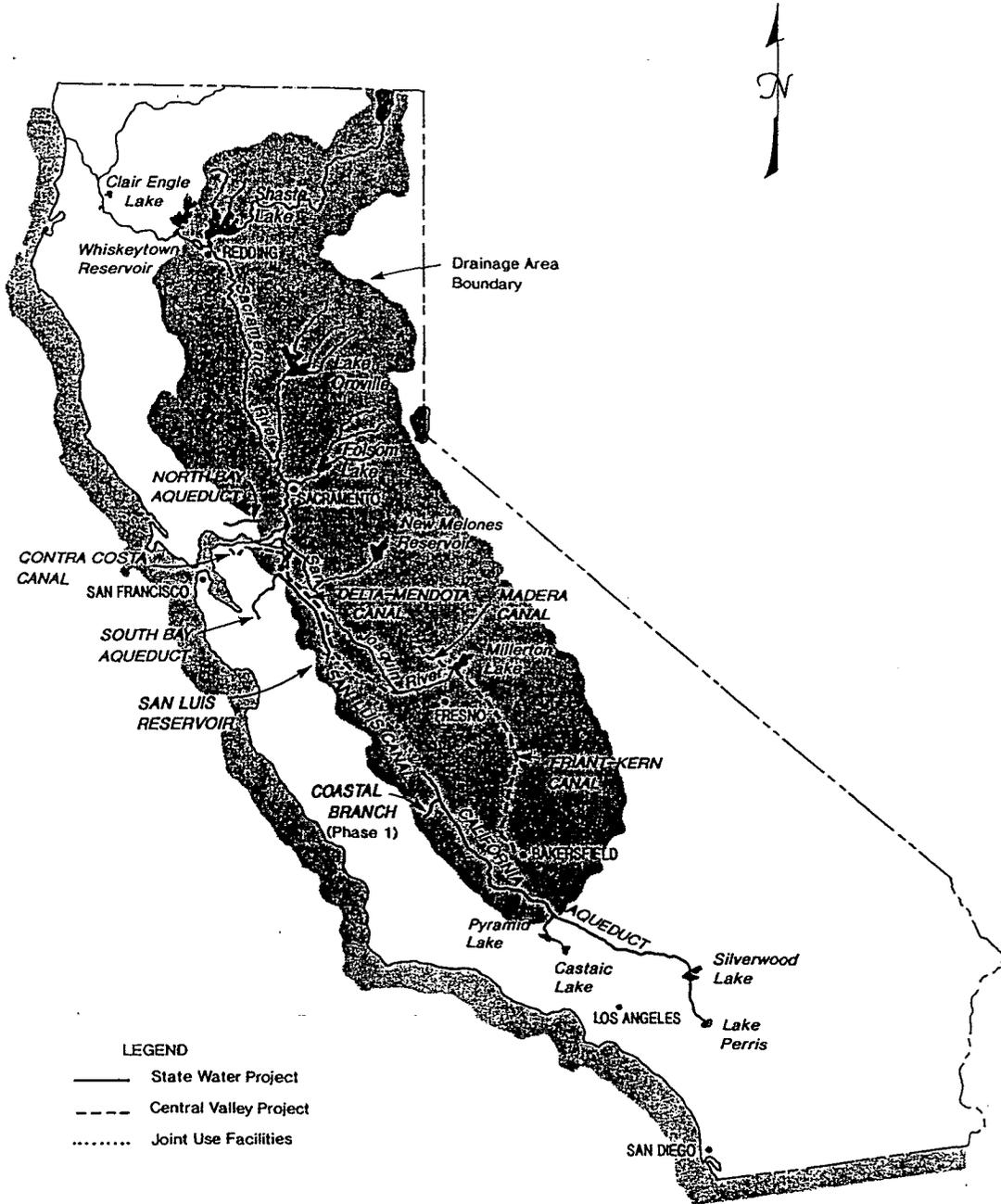
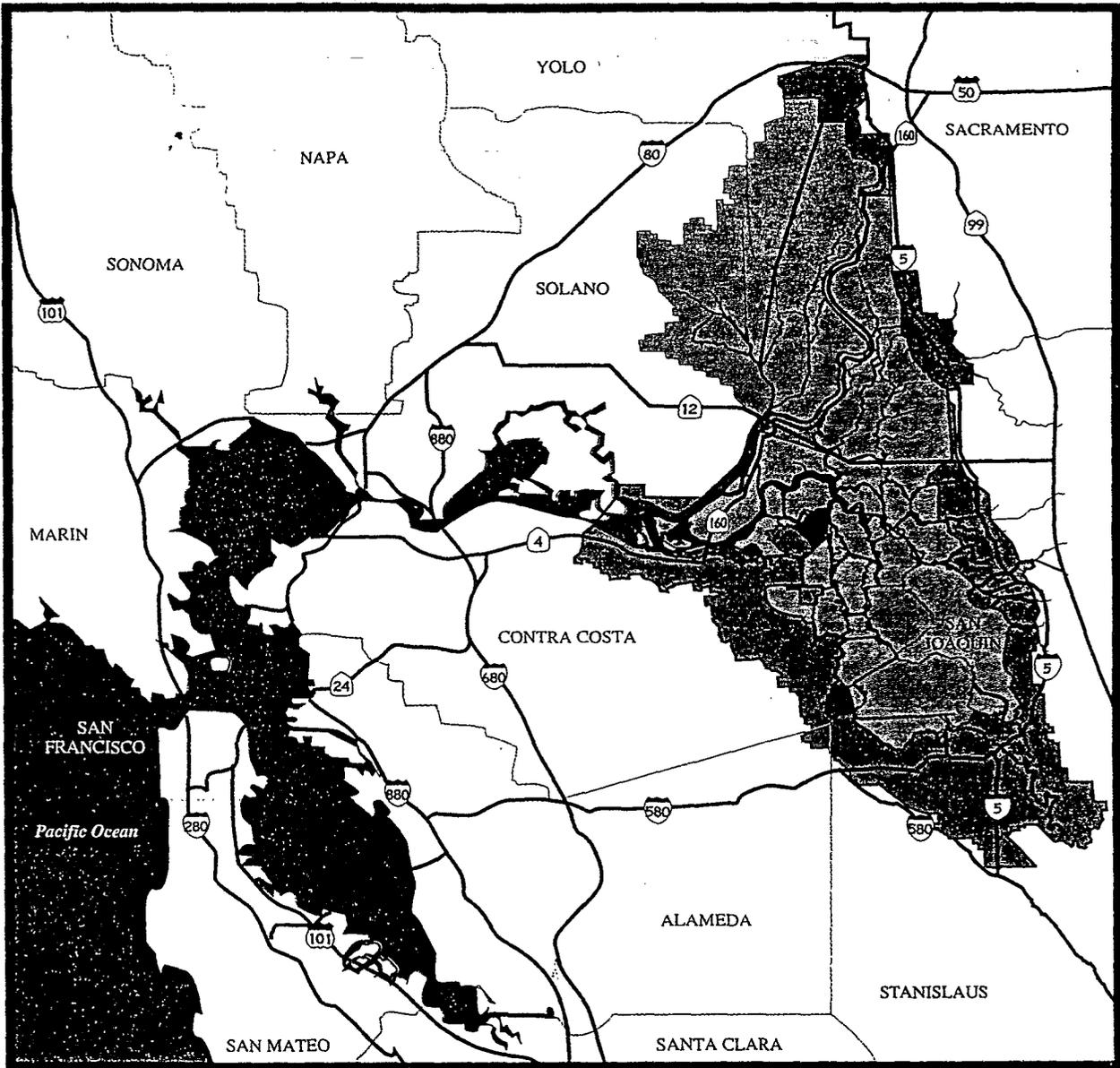


Figure 2: Regional Location Map



LEGEND

-  Primary Zone
-  Secondary Zone

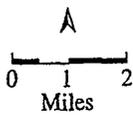


Table 1: Delta Statistics

<u>Demography</u>			
Population: 410,000 (1990)			
Counties: Alameda, Contra Costa, Sacramento, San Joaquin, Solano, Yolo			
Incorporated Cities Entirely Within Delta: Antioch, Brentwood, Isleton, Pittsburg, Tracy			
Major Cities Partly Within the Delta: Sacramento, Stockton, West Sacramento			
Unincorporated Towns and Villages: 14			
<hr/>			
<u>Geography</u>			
Area (acres, 1991):		Levees (miles, 1987):	
Agriculture	538,000	Project	165
Cities and Towns	64,000	Direct Agreement	110
Water Surface	61,000	Non-project	825
Undeveloped	75,000	Total Miles	1,100
Total Acres	738,000		
Rivers Flowing into the Delta: Sacramento, San Joaquin, Mokelumne, Cosumnes, Calaveras			
(These rivers plus their tributaries carry 47 percent of the State's total runoff.)			
<hr/>			
<u>Fish and Wildlife</u>			
Birds	230 species	Reptiles and Amphibians	25 species
Mammals	45 species	Flowering plants	150 species
Fish	52 species		
Major Anadromous Fish: Salmon, Striped Bass, Steelhead Trout, American Shad, Sturgeon			

Source: From Table 7 of the *Sacramento-San Joaquin Delta Atlas*, California Department of Water Resources, 1995.

Recreation in the Delta

The Delta provides a variety of recreational opportunities including fishing, hunting, boating, camping, picnics, and viewing nature. With 700 miles of channels, nearly all of which are navigable, it is one of the largest waterway complexes in the western United States. The Delta also offers secluded, meandering sloughs cloaked with overhanging riparian vegetation. Even in drought years when reservoirs throughout the State were very low and unable to attract as much recreation, the Delta provided the same water-based recreational opportunities as in other years.

The 1996 Delta Boating and Fishing Surveys

In order to quantify the extent of recreational activities, and to identify future development needs of recreation facilities, the Delta Protection Commission contracted in 1996 with the Department of Parks and Recreation to study recreation uses of the Delta, in particular, those related to boating and fishing. The study provides current recreation use figures for the Delta for use by the Commission as well as by other federal, State and local agencies in their planning processes.

The survey involved two separate mail-out questionnaires. The first questionnaire was sent to a random sample of 10,000 registered boat owners and 10,000 licensed anglers throughout California, followed by a second questionnaire sent to approximately 1,500 people in each group. These questionnaires asked a variety of questions such as whether they recreated in the Delta or not and why, how often they participated in specific recreation activities, when and where these activities occur, how much money they spend while visiting the Delta, the adequacy of existing recreation facilities, and recent changes in their level of participation in these activities.

According to the surveys, 23.5 percent of registered boat owners and 23 percent of licensed anglers in California recreated in the Delta in 1996. For those who did not recreate there, the primary reasons given for not doing so was that the Delta was too far from home (53 percent of respondents), and that they were unfamiliar with the recreation opportunities in the Delta (43 percent of respondents).

Boater and Angler Characteristics and Activities

Located near the large population centers of the greater San Francisco Bay area and Sacramento, the Delta serves a growing urban and rural population. Table 2 shows the top ten counties of origin for the boaters and anglers. The list reveals how important proximity of residence to the Delta is in the decision of boaters and anglers to recreate there. While many of the top counties of origin are the same for both activities, they differ in their ranking for visiting the Delta.

Table 2 also lists the main boating and fishing activities, as well as the alternative activities, in which the recreators participated. The top activity for both boaters and anglers was fishing from the boat, with 77 percent of boaters and 88 percent of anglers saying they fished from boats. For boaters, the other boating activities in descending order of frequency were cruising, swimming from the boat, water skiing, sleeping in the boat, sailing and hunting from the boat. For anglers, fishing from shore was the second most popular activity and fishing in tournaments is third.

The next top ten activities that the boaters and anglers engaged in are also given in Table 2. Sightseeing and viewing wildlife are the top two activities for both boaters and anglers. Other popular activities for both groups include picnicking, swimming, walking, photographing nature, attending special events, RV camping, and visiting cultural or historical sites.

The map in Figure 3 gives the location of recreational facilities in the Delta, most of which are located along the waterways. Most of the recreation facilities are provided through private marinas. Of the public facilities, Brannan Island State Recreation Area provides boat launching, camping, swimming, nature interpretation and wind surfing, and the Department of Fish and Game owns five fishing access/launching facilities that are managed by Sacramento and Yolo Counties. Other public facilities include a Department of Parks and Recreation trail and access behind Locke, limited access to the US Fish and Wildlife Service Stone Lakes Refuge, several East Bay Regional Park District sites, San Joaquin County parks, fishing access at Clifton Court Forebay (Department of Water Resources) and many urban recreational sites in Antioch, Pittsburg, Rio Vista, Sacramento, West Sacramento, and Stockton.

Table 2: Delta Recreators' Origins and Activities

<u>Top Ten Counties of Origin</u>					
<u>Rank</u>	<u>Boaters</u>	<u>Percent</u>	<u>Rank</u>	<u>Anglers</u>	<u>Percent</u>
1	Contra Costa	12.5	1	Sacramento	10.7
2	Sacramento	9.9	2	San Joaquin	10.0
3	Alameda	8.6	3	Alameda	8.0
4	Santa Clara	7.9	4	Santa Clara	8.0
5	Los Angeles	7.3	5	Solano	7.6
6	San Joaquin	6.9	6	San Mateo	3.8
7	Stanislaus	3.7	7	Placer	3.6
8	Marin	3.4	8	Los Angeles	3.6
9	Solano	3.1	9	Stanislaus	3.1
10	San Mateo	3.0	10	Sonoma	2.0
	Subtotal	66.3		Subtotal	60.4

<u>Major Boating and Fishing Activities</u>					
	<u>Boating</u>	<u>Percent*</u>		<u>Fishing</u>	<u>Percent*</u>
1	Fishing from boat	77	1	Fishing from boat	88
2	Cruising	76	2	Fishing from shore	74
3	Swimming from boat	71	3	Fishing in tournament	14
4	Water skiing	61			
5	Sleeping in boat	49			
6	Sailing	15			
7	Hunting from boat	5			

<u>Top Ten Activities After Boating and Fishing</u>					
	<u>Boaters</u>	<u>Percent*</u>		<u>Anglers</u>	<u>Percent*</u>
1	Sightseeing	45	1	Sightseeing	52
2	Viewing wildlife	41	2	Boating	49
3	Fishing from shore	40	3	Viewing wildlife	49
4	Picnicking	34	4	Swimming	40
5	Walking for pleasure	32	5	Walking for pleasure	39
6	Swimming from shore	30	6	Picnicking	37
7	Attending special events	28	7	Photography of nature	25
8	Photography of nature	21	8	Attending special events	25
9	RV camping	20	9	RV camping	23
10	Visiting cultural or historical sites	18	10	Visiting cultural or historical sites	23

* Percentages do not sum to 100, since recreators participate in more than one alternative activity.
 Source: From the *Sacramento-San Joaquin Delta Recreation Survey* report, California State Parks, August 1997.

Boater and Angler Recreation in the Delta

Table 3 provides the survey estimates of boating and angling activities, including their duration and frequency. The activities are counted in terms of group (e.g., family or friends) trips and days spent recreating in the Delta. An estimated 186 thousand groups boated on the Delta. These boaters spent an average 26.1 days in the Delta during the year. Therefore a total of 4.9 million group days were spent on boating recreation. The average size of a group was 3 people, implying a total of 14.4 million person days of recreational boating in the Delta per year.

An estimated 169 thousand groups go fishing per year in the Delta. These anglers spent an average of 24 days per year in the Delta. Therefore a total of 4.1 million group days were spent on recreational fishing. Since the average group size was 2.9 people, this implies a total of 11.8 million person days of recreational fishing per year.

The boating activities in Table 3 represent only boating by those who owned registered boats (boats with motors). Since people who do not own registered boats may also boat in the Delta with canoes, kayaks, rowboats or rented boats, this represents a lower bound for boating activities. In the same sense, activities connected with fishing in the Delta may be underestimated if people fish there without a licensed angler in the group.

We can not estimate combined fishing and boating activities in the Delta from the data. Adding the two activities together would lead to double-counting since many people would be both registered boaters and licensed anglers.

Table 3: Boating & Fishing Surveys of Delta Recreation*

Activity	Estimated Number of Groups	Average No. of Days Per Year	Total Group Days Per Year	Average No. of People Per Trip	Estimated Total Person Days Per Year
Boating	186,000	26.1	4,854,600	2.97	14,418,162
Fishing	169,200	24.0	4,060,800	2.91	11,816,928

* Boating and fishing activities can not be added together due to double-counting -- a large majority of boaters fished, and many anglers boated.

Sources: correspondence, California State Parks and Recreation; *Sacramento San Joaquin Delta Recreation Survey*, California State Parks and Rec.reation, Aug. 1997; own calculations.

The Economy of the Delta Region

The Delta economy, in 1994, represented 1.5 percent of personal income in California and 1.8 percent of employment (Table 4). The region provides a variety of opportunities for employment. Table 5 gives the interindustry transactions in the Delta economy in 1994. Reading the numbers as columns, the values represent the amount purchased by an industry from different sectors, including value added (essentially labor and profits), as inputs used to produce/provide the industry's goods or services. For example, in order to produce \$911 million worth of agricultural goods, the Delta's agricultural industry purchased \$77 million worth of inputs from local agricultural producers and \$21 million of inputs from the local manufacturing sector, while \$584 million went to labor, farm income, and land leases. Reading the numbers as rows, the values represent the amount sold by an industry to other sectors, exported, or sold as final demand. For example, the Delta's agricultural sector sold \$77 million to its own producers and \$80 million to local manufacturers, and exported \$686 million (or 75 percent) of its output. Total industry outlay (total inputs into production) always equals total industry output (total sales).

Manufacturing is the largest sector, producing \$4.5 billion worth of goods in the Delta. This is followed by trade (wholesale and retail), generating \$3 billion in output, and services, creating \$2.9 billion in output. Agriculture contributes a little under \$1 billion to the region. The entire Delta generates \$21.2 billion in output.

The transactions tables reflect the fact that the Delta is an open economy which relies greatly on trade with surrounding regions. Exports from the region are \$5.6 billion, while intermediate sales to local industries are \$4.8 billion.

Table 4: Delta Economy Compared With California, 1994

	Delta	California	Percent of California
Personal Income (Mil.\$)	10,610	715,922	1.48
Employment (Number Employed)	249,094	14,122,000	1.76

Sources: California Statistical Abstract, 1997, Department of Finance, and Minnesota IMPLAN Group, Inc., Stillwater, Minnesota.

Table 5: Interindustry Transactions in the Delta Economy, 1994 (millions of dollars)

Producing Industry	Local Industry Purchases										Row Total	Total Exports*	Final Demand*	Industry Output
	Agric	Mining	Construc	Manufac	TCPU*	Trade*	FIRE*	Services	Govern't	Other				
Agriculture	77	0	4	80	1	4	5	1	0	0	172	686	54	911
Mining	0	2	3	26	21	1	0	1	2	0	55	128	6	189
Construction	4	18	1	37	131	41	82	41	74	0	430	0	1,528	1,958
Manufacturing	21	3	130	442	52	64	13	78	9	0	812	2,957	758	4,527
TCPU*	11	6	30	155	371	95	38	65	38	0	808	929	729	2,466
Trade*	17	3	130	213	88	90	15	50	8	0	613	218	2,211	3,043
FIRE*	19	11	20	44	84	133	340	117	7	0	775	385	1,513	2,673
Services	7	3	72	127	121	246	125	259	14	0	974	9	1,888	2,871
Government	2	1	4	22	38	18	24	20	5	0	133	301	2,187	2,621
Other	0	0	0	0	0	0	0	0	0	0	1	4	0	5
Column Total	158	46	394	1,147	906	692	643	632	156	0	4,773	5,616	10,875	21,264
Total Imports*	161	26	382	1,452	428	315	243	327	53	0	3,386			
Value Added*	584	117	1,166	1,884	1,099	1,989	1,763	1,865	2,409	5	12,880			
Misc.	8	1	16	45	33	47	24	47	3	0	225			
Total Industry Outlay	911	189	1,958	4,527	2,466	3,043	2,673	2,871	2,621	5	21,264			

*TCPU = Transport, communications, and public utilities

Trade = Retail and wholesale trade

FIRE = Financial, insurance, and real estate

Exports = Sales outside of the Delta region

Final Demand = Household consumption, federal, state and local government purchases, inventory purchases, and capital formation

Imports = Purchases outside of the Delta region

Value Added = Employment compensation (wages and salaries), proprietors' and other property-type income (dividends and interest), and indirect business taxes.

Recreation Expenditures

Table 6 provides average and estimated group expenditures for boating and fishing. Although the recreational activity occurs within the Delta, many of the expenditures occur outside of the Delta. For example, much of the food and supplies may be purchased outside of the Delta, and even lodging and recreation occur outside of the Delta if recreators stay in or visit other sites outside of the Delta. While the majority of boating expenditures occur inside the Delta, anglers spent more outside.

On an average trip, boaters as a group spent \$139 within the Delta and \$96 outside of the Delta, while anglers spent \$111 within, and \$123 outside. A general breakdown of these expenditures into lodging, food, supplies and recreation is given in Table 6. Annually, boaters are estimated to spend \$247 million inside the Delta and \$171 million outside, totaling \$418 million. Anglers spend an estimated \$186 million inside the Delta and \$206 million outside, totaling \$392 million.

Table 6: Estimated Recreational Expenditures from Surveys*

Activity / Expenditure Item	Average Expenditure Per Trip		Estimated Expenditures for All Trips in 1995		Total Annual Expenditures 1000 Dollars
	Inside Delta	Outside Delta	Inside Delta	Outside Delta	
	Dollars	Dollars	1000 Dollars	1000 Dollars	
Boating					
Lodging	23.90	12.59	42,656	22,470	65,127
Food	38.07	24.02	67,947	42,870	110,817
Supplies	51.71	40.21	92,291	71,766	164,057
Recreation	24.87	18.86	44,387	33,661	78,048
Total for Boating	138.55	95.68	247,281	170,768	418,049
Fishing					
Lodging	30.12	32.75	50,378	54,777	105,154
Food	29.75	28.21	49,759	47,183	96,942
Supplies	31.11	41.14	52,034	68,809	120,843
Recreation	20.23	21.19	33,836	35,442	69,278
Total for Fishing	111.21	123.29	186,006	206,211	392,217

* Boating and fishing activities can not be added together due to double-counting -- a large majority of boaters fished, and many anglers boated.

Sources: *Sacramento San Joaquin Delta Recreation Survey*, California State Parks, Aug. 1997; own calculations.

The Input-Output Model

Economists have long been interested in estimating the total economic impact generated by an activity. In this case we are interested in the economic impacts of boating and fishing on the Delta region. These recreational activities generate expenditures (see the previous section) in the local economy. The local businesses that received these funds in turn hire a certain proportion of the local labor and pay for local services. The local recipients turn around again and spend a portion of their receipts in the local economy. Therefore every dollar spent in the region will have multiplier effects that reflect not only the direct impact of boating and angling expenditures within the economy, but also the ripple effects that these expenditures create as businesses and employees spend the money they receive on other businesses within the region, to either provide the services necessary for their operation or to consume final goods.

The more that people and institutions buy and sell within the given economy, the greater the multiplier effects. In this report we are concerned with the impacts of these recreational activities on the immediate Delta region. Their impacts on the state of California will obviously be much larger since, as shown in Table 6, many of the recreational expenditures are made outside of the Delta, and in addition, many of the economic ripple effects of the within-Delta expenditures will occur outside of the immediate Delta region.

Economic Impacts of Recreation

The IMPLAN (Impact analysis for PLANning) system, was designed by the United States Forest Service, United States Department of Agriculture, for the purpose of estimating economic input-output models for any county, or group of counties, in the United States. It does this with a large database, and software and algorithms to estimate regional input-output models from this secondary published data. The system has comprehensive and detailed data on every area of the United States, and the ability to turn this data into dollar flows or transaction tables (e.g., Table 4). In turn, these transactions tables can be transformed into multipliers for the region so that the total regional impact of increasing or reducing economic activity in one industry (or sector) can be estimated.

Zip-code areas were used to identify the region to be covered in this economic analysis. While the area covered does not exactly match the official Delta area, the zip-codes were chosen to best designate the population that lives within the Delta area, thus representing the economically productive portion of the Delta.

Economic impacts are measured in terms of: (1) total Delta output (sales) impacts, (2) Delta income impacts, (3) Delta value-added* impacts, and (4) Delta employment impacts. An input-output multiplier is the sum of the direct, indirect, and induced effects of expenditures. The *direct effect* occurs when the recreators purchase goods and services (i.e., their expenditures). The *indirect effect* occurs when the industries that recreators purchase from must purchase inputs and supplies from services and manufacturers within the Delta. The *induced effect* occurs as workers in the Delta receive income from those purchases and then spend the income on consumer goods and services produced in the regions. Together, these three effects make up the total impact on the economy.

To illustrate these concepts, every dollar spent on lodging in the Delta generates a total of \$1.87 of economic output (sales) in the region, which includes a direct impact of \$1, and indirect and induced effects of \$0.87. It also generates \$0.75 in income, and \$1.14 in value-added. Every million dollars spent on lodging generates 31 local jobs.

Table 7 gives the impacts of recreational expenditures (boating and fishing) on the Delta region economy. The first column of figures gives the expenditures for boating and fishing in each category estimated in Table 6. Because of the multiplier effects, the total boating expenditures of \$247 million generate \$445 million in total output, \$183 million in income, \$279 million in value added, and 8,058 jobs within the Delta region. For fishing, expenditures of \$186 million generate \$336 million in total output, \$138 million in income, \$209 in value-added, and 6,152 jobs.

These values represent 1.7 percent of total Delta income and 3.2 percent of employment in the Delta for boating recreation. Fishing recreation impacts represent 1.3 percent of total Delta income and 2.5 percent of employment.

These estimated participation rates and impacts represent a lower bound for these activities, since the surveys measured only participation by registered boat owners and licensed anglers. To the extent that boaters recreate in the Delta without registered boats (e.g., in rowboats, canoes, kayaks or rented boats), or people fish without a licensed angler in their party, the estimates will understate these recreational activities.

The above analysis suggests that recreational boating and fishing are an important part of the Delta economy. The fact that 23 percent of boaters and anglers in California recreate here every year further demonstrates that the Delta provides an important outlet for water recreation in California.

* Value-added is made up of wages and salaries, dividends, interest, and indirect business taxes.

Table 7: Impacts of Boating and Fishing Activities in the Sacramento-San Joaquin Delta, 1995*

Activity / Expenditure Category	Expenditures in the Delta Dollars	Impacts on the Delta Region			
		Output Dollars	Income Dollars	Value Added Dollars	Employment No. of Jobs
BOATING					
Overnight lodging, including campgrounds	42,656,228	79,796,449	32,178,948	48,539,280	1,331
Food and drinks at cafes or snack stands	67,946,552	122,791,261	44,357,174	65,917,471	2,510
Supplies, gas, repairs, parking, gifts, etc.	92,290,943	163,671,219	71,198,206	109,863,984	2,381
Recreation: equip. bought/rented, fees, etc.	44,387,464	78,318,411	35,667,934	54,884,873	1,836
Total for Boating	247,281,188	444,577,339	183,402,263	279,205,609	8,058
% of Delta Total			1.73%	2.17%	3.23%
FISHING					
Overnight lodging, including campgrounds	50,377,752	94,241,002	38,003,900	57,325,739	1,572
Food and drinks at cafes or snack stands	49,758,901	89,923,006	32,483,830	48,272,956	1,838
Supplies, gas, repairs, parking, gifts, etc.	52,033,594	92,277,762	40,141,518	61,941,267	1,342
Recreation: equip. bought/rented, fees, etc.	33,836,053	59,701,223	27,189,256	41,838,107	1,400
Total for Fishing	186,006,300	336,142,994	137,818,504	209,378,069	6,152
% of Delta Total			1.30%	1.63%	2.47%

* Boating and fishing impacts can not be aggregated together due to double-counting -- a large majority of boaters fished, and many anglers boated.
Source: own calculations.