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**State & Federal Contractors
Water Agency**

1121 L Street, Suite 806, Sacramento, CA 95814

May 31, 2011

Campbell Ingram
Executive Director
Delta Conservancy
3500 Industrial Blvd
West Sacramento, CA 95691

Michael Machado
Executive Director
Delta Protection Commission
14215 River Road
P.O. Box 530
Walnut Grove, CA 95690

Phil Isenberg
Chairman
Delta Stewardship Council
980 Ninth Street, Suite 1500
Sacramento, Ca 95814

RE: Characterization of the Delta's Agricultural and Recreational Economy

Dear Messrs. Ingram, Machado and Isenberg:

At the May Delta Conservancy meeting, the issue of the size and growth potential of the Delta's Recreational Economy vs. Agricultural economy was discussed. Enclosed is a February 2008 report on this very subject that was commissioned by my then consulting firm, Byron Buck and Associates that addresses this subject, characterizing the size and nature of the agricultural and recreational economies of the Delta. It is unlikely that the broad conclusions of the report are more than marginally different today.

In summary, in 2007 dollars, Agriculture in the Delta generates about \$730 million in annual sales, with field crops dominating 70% of irrigated acreage. However, while accounting for 30% of irrigated acreage, truck and orchard crops generate about 65% of farm revenue. Based on 1998-2004 crop revenues, Delta agriculture generates nearly \$1 billion in annual statewide output, supporting about 7,600 jobs statewide.

In contrast, recreation in the Delta contributed about \$1.2 billion statewide and supports 17,000 jobs. About 7 million people currently visit the Delta (visitor-days) for recreation annually, forecasted to reach

- Directors*
- James M. Beck**
Kern County Water Agency
 - Jeff Kightlinger**
Metropolitan Water District of Southern California
 - Bill Harrison**
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 - Beau Goldie**
Santa Clara Valley Water District
 - Steve Robbins**
Jill Duerig
State Water Project Contractors Authority
 - Tom Birmingham**
Westlands Water District

8 million visitor days by 2020. Further, based on some draft analysis we've commissioned, there appears to be a great unmet demand for additional recreation in the Delta. For example, there are four activities within a five state Pacific region that are predicted to increase in the amount of participation by 85 to 89 percent by 2050: motorboating, canoeing, hiking, and sightseeing. More modest but still substantial growth in participation is predicted for developed camping (73 percent) and wildlife viewing, birdwatching, and photography (77 percent). Given the Delta is surrounded by growing urban areas, it is well-poised to capitalize on this recreation growth potential and integrate this with necessary habitat restoration activities required by the Delta Reform Act, to provide an opportunity to both diversify and improve the economy of the Delta region.

SFCWA is also updating some studies on the economic impact of habitat restoration on Delta Counties using more recent cost estimates for restoration projects based on current actual experience. The SFCWA Board will also consider updating some prior work on recreational demand, noted above. We will share those studies when complete.

I trust that you will all find this information useful in development of plans for the Delta.

Sincerely,

A handwritten signature in black ink, appearing to read "Byron M. Buck". The signature is fluid and cursive, with a long horizontal stroke at the end.

Byron M. Buck
Executive Director

cc. Jerry Meral, Assistant Secretary for Resources

attachment: Characterization of Delta's Agricultural and Recreational Economy



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MITCHELL@MCUBED-ECON.COM

Date: February 14, 2008

From: David Mitchell

To: Byron Buck

Re: Characterization of Delta's Agricultural and Recreational Economy

Introduction

This memorandum compiles and summarizes information on the type, extent, geographic distribution, and economic value of agricultural and recreational activities in the Sacramento-San Joaquin River Delta (Delta). It begins with a general description of the Delta, including its physical and legal boundaries. It then addresses agricultural production in the Delta, summarizing available data on acreage, crop mix, production value, and regional economic linkages. Next, it gives an overview of recreation in the Delta and summarizes available information on Delta recreational infrastructure and facilities, demand for Delta recreation, and regional economic linkages. Each section concludes with a summary of findings.

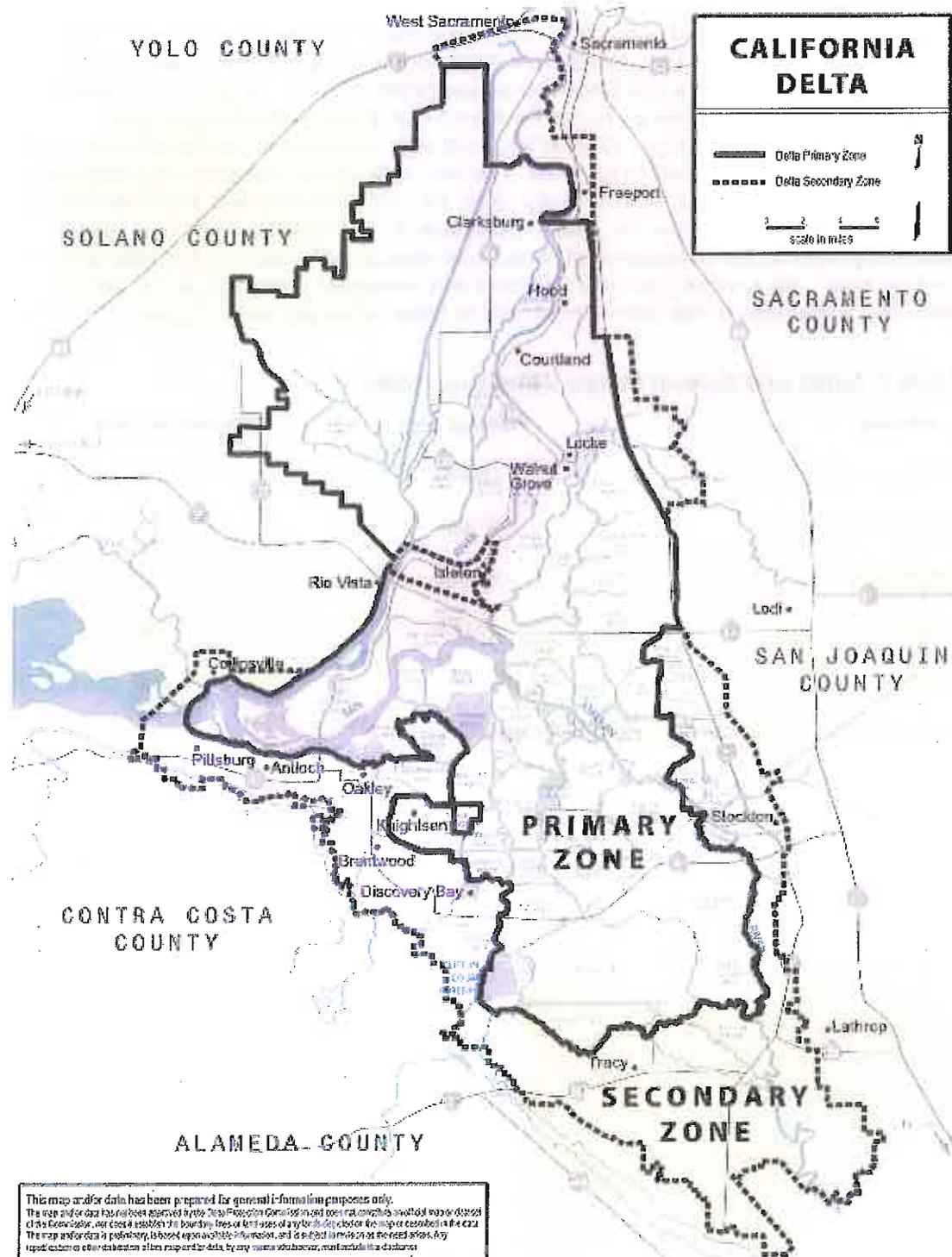
The Delta

The Delta covers 738,000 acres interlaced with hundreds of miles of waterways. Much of the land is below sea level and relies on more than 1,000 miles of levees for protection against flooding. Its land and waterways support communities, agriculture, and recreation, and provide essential habitat for fish and wildlife.

The Delta Protection Act of 1959, codified the boundaries of the Delta to include portions of five counties: Contra Costa, Sacramento, San Joaquin, Solano, and Yolo. The boundaries of "the legal Delta" generally describe a region starting in the north at the city of Sacramento, with the city of Tracy towards the southern end, the city of Stockton at the eastern boundary and the city of Antioch at the western tip.

The legal Delta is divided into two zones: the Primary Zone and the Secondary Zone (Figure 1). The Primary Zone is the area within the legal boundaries of the Delta but outside urban limit lines and a city's sphere-of-influence as adopted or under study as of January 1, 1992. The Secondary Zone is the area within the legal Delta not included in the Primary Zone. The precise boundary lines of the Primary Zone includes the land and water areas as shown on the map titled "Delta Protection Zones" on file with the California State Lands Commission. The Primary Zone consists of approximately 500,000 acres. The Secondary Zone consists of approximately 238,000 acres. Under the Johnston-Baker-Andal-Boatwright Delta Protection Act of 1992, the Delta Protection Commission (DPC) is required to develop and adopt a Land Use and Resource Management Plan for the Primary Zone. The first such plan was adopted in 1995. The plan was most recently updated in 2002.

Figure 1. California Delta



Delta Agriculture

As of 2004, agricultural land uses comprised two-thirds of the Delta's total area (Table 1). The Delta grows more than 90 different crops, producing \$730 million annually in farm sales for the California and Delta economies (2007 dollars). Most Delta farmland, about 75 percent, is classified as Prime Farmland – land best suited to food, feed, forage, fiber, and oilseed crops. Most of this land was converted to farmland through the diking and draining of flooded Delta lands. The last Delta island was diked and drained in the early 1930's (Lund, et al. 2007). By 1930, 441,000 acres of Delta wetlands had been reclaimed and put under the plow.¹ Cultivation of this reclaimed land has been a major contributor to the subsidence of most Delta islands, particularly in the West and Central Delta.² As a consequence of intensive and sustained cultivation of the Delta's peat soils, large parts of the Delta are ten feet or more below sea level (Figure 2).

Table 1. Delta and Suisun Marsh Land Use - 2004

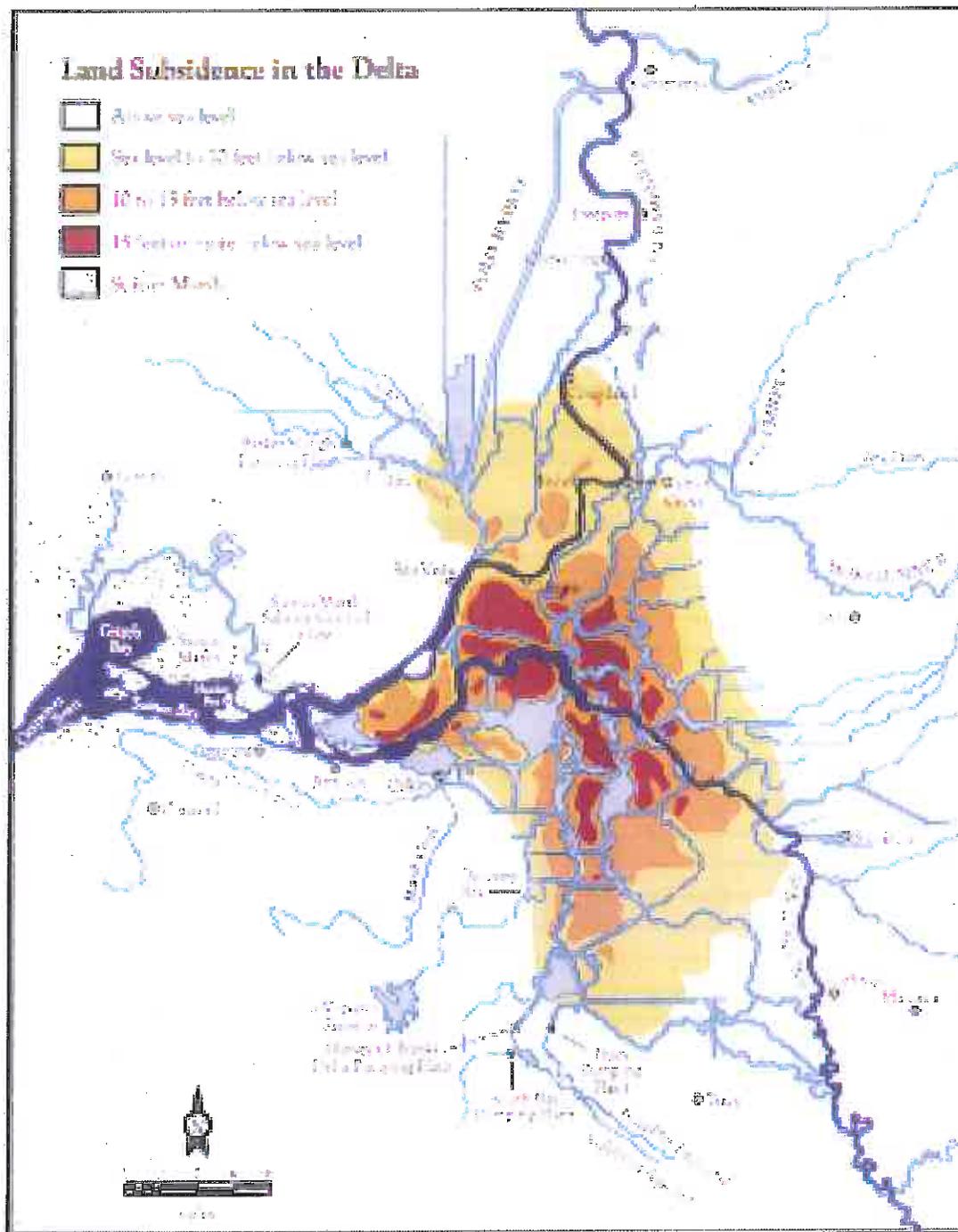
Land Use	Acreage	Percent of Total
Urban and Built-up Land	74,098	9
Agricultural Land	557,896	67
Other Land	120,535	14
Water	85,065	10
Total	837,594	100

Source: Delta Visions Agricultural Context Memorandum, P. 4.

¹ Lund, et al. (2007)

² Trott (2007)

Figure 2. Land Subsidence in the Delta



SOURCE: Department of Water Resources (1995)

Acres and Crops

Production of field crops dominates agricultural land uses in the Delta (Table 2), accounting for about 70% of irrigated acreage. The other 30% of irrigated acreage is divided among truck crops (18%), orchards and vineyards (11%), and nursery and seed

crops (1%). Four crops -- alfalfa, corn (grain and silage), wheat, and irrigated pasture -- account for 80% of irrigated field crop acreage (Table 3). Processing tomatoes and asparagus account for nearly 70% of truck crop acreage (Table 4). Wine grapes and pears account for almost 80% of orchard acreage (Table 5). Seed crops account for about three-fourths of Nursery & Seed acreage.

Table 2. Delta Agricultural Acreage by Crop Group: 1998-2004

Crop Group	% Of Irrigated Acres
Field	70
Truck	18
Orchards & Vine	11
Nursery & Seed	1
Animal Husbandry	NA
Total	100

Rounded to nearest whole percent.

Source: DWR 2006, "The Value of the Agricultural Output of the California Delta," Revised Draft DWR Paper by Jim Rich, DWR, DPLA. August 21, 2006.

Table 3. Delta Field Crop Acreage: 1998-2004

Field Crop	Acreage	% of Total	Cumulative %
Alfalfa hay	70,405	25%	25%
Corn, grain	57,143	20%	45%
Wheat	39,967	14%	59%
Corn, silage	37,366	13%	72%
Irrigated pasture	27,346	10%	81%
Safflower	15,342	5%	87%
Misc. field crops	8,882	3%	90%
Dry beans	8,705	3%	93%
Grain hay	6,636	2%	95%
Rice	4,700	2%	97%
Non-corn silage	3,232	1%	98%
Rye grass	2,158	1%	99%
Barley	1,487	1%	99%
Oat hay	1,000	0%	100%
Grain sorghum	900	0%	100%
Sudan grass	207	0%	100%
Total	285,476	100%	

Rounded to nearest whole percent.

Source: DWR 2006, "The Value of the Agricultural Output of the California Delta," Revised Draft DWR Paper by Jim Rich, DWR, DPLA. August 21, 2006.

Table 4. Delta Truck Crop Acreage: 1998-2004

Crop	Acreage	% of Total	Cumulative %
Processing tomatoes	26,604	36%	36%
Asparagus	22,927	31%	68%
Misc. vegetables	6,117	8%	76%
Fresh tomatoes	5,240	7%	83%

Sweet corn	4,650	6%	89%
Potatoes	2,509	3%	93%
Pumpkins	1,785	2%	95%
Cucumbers	1,559	2%	97%
Melons	1,452	2%	99%
Onions	305	0%	100%
Squash	80	0%	100%
Total	73,228	100%	

Rounded to nearest whole percent.

Source: DWR 2006, "The Value of the Agricultural Output of the California Delta," Revised Draft DWR Paper by Jim Rich, DWR, DPLA. August 21, 2006.

Table 5. Delta Orchard & Vine Crop Acreage: 1998-2004

Crop	Acreage	% of Total	Cumulative %
Wine grapes	27,262	64%	64%
Pears	6,448	15%	79%
Walnuts	3,653	9%	87%
Almonds	1,788	4%	91%
Apricots	1,190	3%	94%
Misc. fruits & nuts	1,015	2%	96%
Apples	947	2%	99%
Cherries	473	1%	100%
Peaches	109	0%	100%
Total	42,885	100%	

Rounded to nearest whole percent.

Source: DWR 2006, "The Value of the Agricultural Output of the California Delta," Revised Draft DWR Paper by Jim Rich, DWR, DPLA. August 21, 2006.

Geographic Distribution of Crop Acreage

Crop acreage is not uniformly distributed throughout the Delta (Table 6). The northern and southern parts of the Delta account for about three-fourths of all irrigated acreage in the Delta, whereas the western and central parts of the Delta account for just 13% (Table 6, Figure 2³). In the West Delta, where subsidence and soil salinity problems are greatest, production is almost entirely field crops, pasture, and livestock. In the Central Delta, field crop production also predominates, accounting for more than 80% of irrigated acreage. In general, the proportion of irrigated acreage planted to truck and orchard crops increases as one moves away from the western and central parts of the Delta. On the eastern side of the Delta, truck and orchard acreage account for about 33% of irrigated acreage; in the South Delta, it is about 37% of irrigated acreage; and in the North Delta, it is about 27% (Table 6).

Approximately 85% of irrigated acres are within the Primary Zone of the Delta (Table 7). Field crop acreage accounts for 73% of irrigated acreage in the Primary Zone compared to 63% in the Secondary Zone. Problems with subsidence, soil salinity, and risk of

³ The regions shown in Figure 2 were constructed for purposes of this memo and are not based on any legally or institutionally designated boundaries within the Delta. The boundaries shown in Figure 2 are similar to those shown in Figure 3.3 of Lund, et al. (2007).

flooding in the Primary Zone of the Delta most likely account for the skew towards field crop production in the Primary Zone of the Delta.
Attachment 1 at the end of this memorandum provides estimated crop acreage by Delta island and tract.

Table 6. Irrigated Acreage by Delta Region

Delta Region's Share of Total Delta Irrigated Acreage						
Crop	West	Central	South	East	North	Total
Field	7%	11%	30%	11%	41%	100%
Truck	1%	7%	56%	14%	22%	100%
Orchard & Vine	1%	5%	19%	13%	63%	100%
Total	5%	9%	34%	12%	40%	100%
Delta Region's Crop Mix						
Crop	West	Central	South	East	North	Total
Field	97%	81%	63%	67%	73%	71%
Truck	2%	14%	31%	21%	10%	18%
Orchard & Vine	1%	5%	6%	12%	17%	11%
Total	100%	100%	100%	100%	100%	100%

Table 7. Irrigated Acreage by Delta Zone

Delta Zone's Share of Total Delta Irrigated Acreage			
Crop	Primary	Secondary	Total
Field	87%	13%	100%
Truck	79%	21%	100%
Orchard & Vine	83%	17%	100%
Total	85%	15%	100%
Delta Zone's Crop Mix			
Crop	Primary	Secondary	Total
Field	73%	63%	71%
Truck	17%	26%	18%
Orchard & Vine	10%	12%	11%
Total	100%	100%	100%

Seed & Nursery	52,410,386	7	12,155
Total	729,580,035	100	1,797

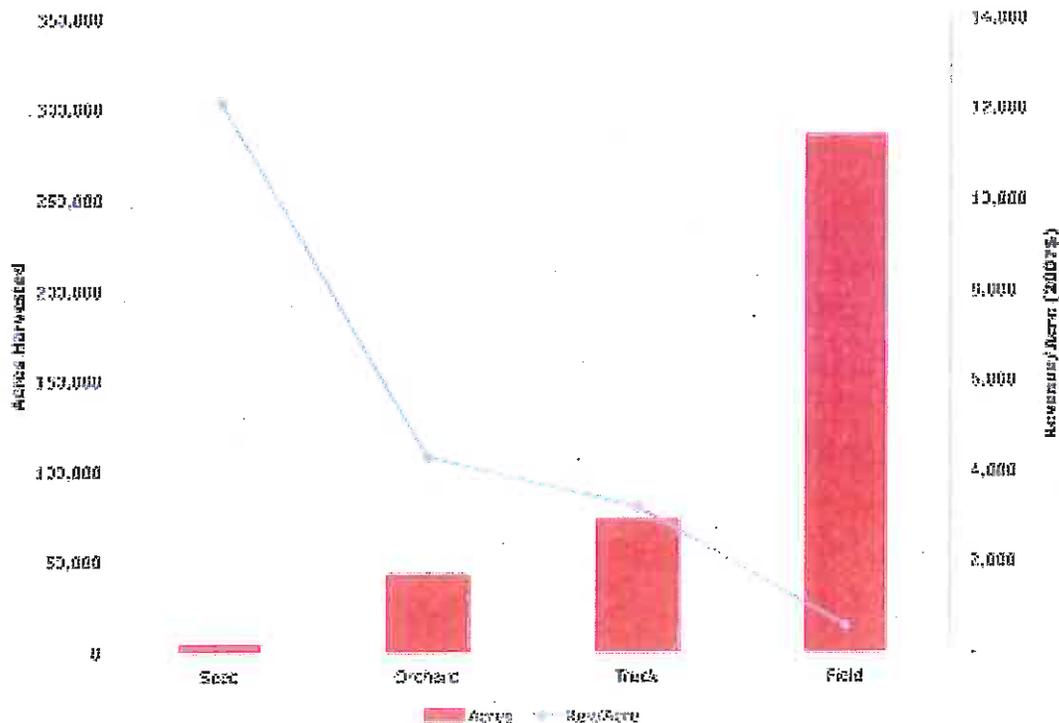
Rounded to nearest whole percent.

Source: DWR 2006, "The Value of the Agricultural Output of the California Delta," Revised Draft DWR Paper by Jim Rich, DWR, DPLA. August 21, 2006.

The amount of revenue generated by an acre under cultivation in the Delta varies significantly by crop type (Table 8 and Figure 3). At over \$12,000 per acre, seed and nursery crops generate the most revenue per acre. Orchard and truck crops produce about \$4,300 and \$3,200 per acre, respectively. At under \$600 per acre, field crops produce the least amount of revenue per acre.

Revenue per acre is inversely proportional to the amount of harvested acreage (Figure 3). While seed and nursery crops generate over \$12,000 per acre in revenue, they account for just 1% of harvested acreage in the Delta. Likewise, truck and orchard crops account for less than a third of harvested acreage. Soil quality, flood risk, and market constraints limit opportunities to expand production of these high revenue-generating crops in the Delta. Put differently, while production of higher revenue-generating crops in the Delta could be expanded, the risk of loss would likely outweigh the potential return.

Figure 4. Revenue/Acre and Acreage by Crop Group: 1998-2004



Geographic Distribution of Agricultural Revenue

As with crop acreage, crop revenue is not uniformly distributed throughout the Delta. Revenue per acre increases as one moves out from the western and central parts of the Delta, where problems with subsidence and soil salinity are greatest (Figure 4). Average crop revenue per acre in the western part of the Delta is less than half the average for the entire Delta (Table 9).⁴ In the central part of the Delta, it is about 80% of average, whereas in the eastern and southern parts of the Delta it is about 110% of average.

The southern and northern parts of the Delta account for over three-quarters of crop revenue out of the Delta. The eastern region accounts for about 13% and the central and western parts just 9% (Table 9).

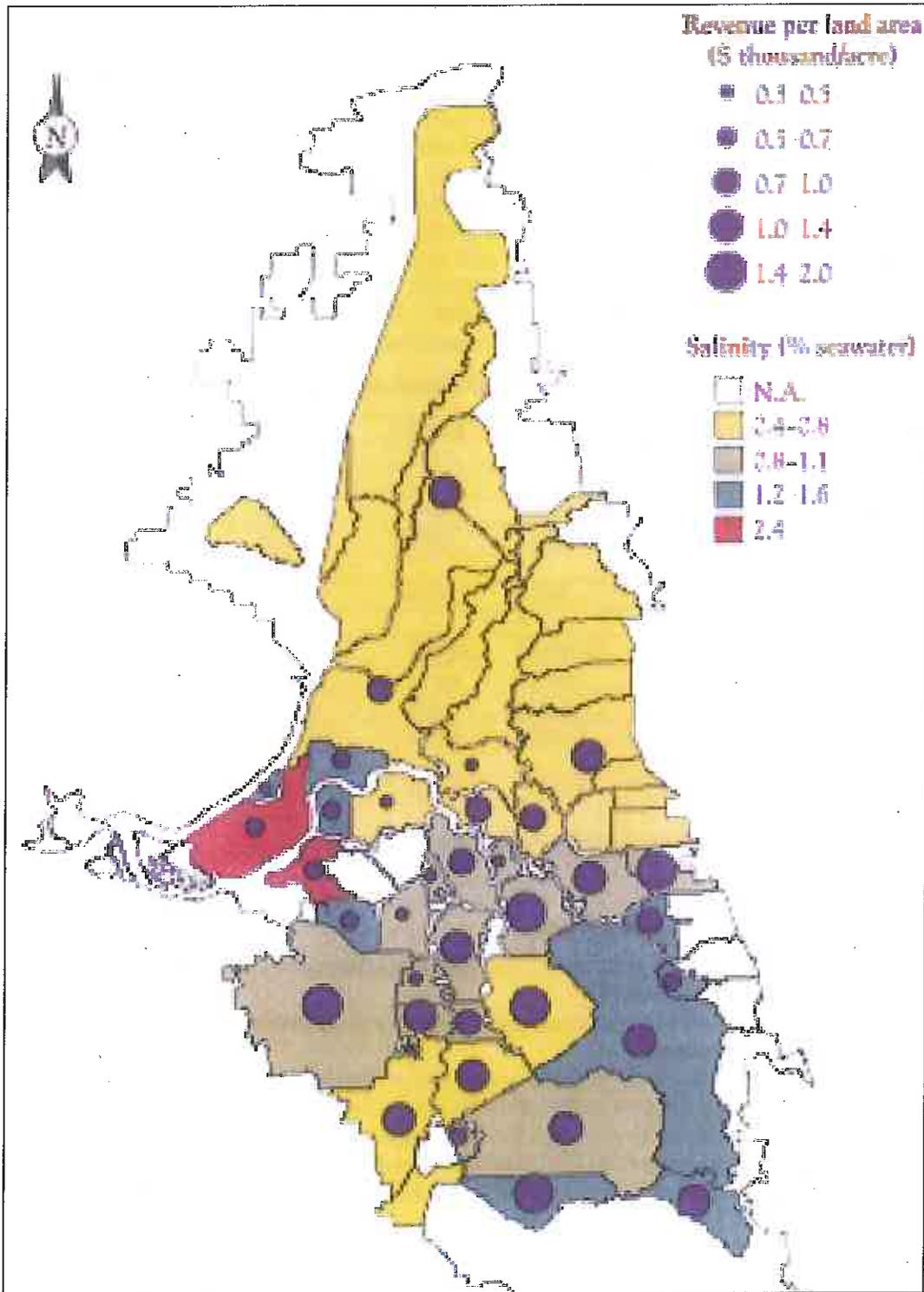
In the western Delta, production of field crops accounts for over 80% of crop revenue (Table 9). This stands in contrast to the other parts of the Delta, where revenue from orchard and truck crops accounts for the majority of crop revenue. In the central part of the Delta truck and orchard crops produce 60% of crop revenue. In the southern, eastern, and northern areas of the Delta, orchard and truck crops account for between 70% and 80% of annual crop revenue.

Table 9. Crop Revenue by Delta Region

Delta Region's Share of Total Delta Crop Revenue						
Crop	West	Central	South	East	North	Total
Field	7%	11%	30%	11%	41%	100%
Truck	1%	7%	56%	14%	22%	100%
Orchard & Vine	1%	5%	19%	13%	63%	100%
Total	2%	7%	37%	13%	40%	100%
\$/Acre	665	1,123	1,604	1,572	1,455	1,448
% of Avg.	46%	78%	111%	109%	101%	
Delta Region's Source of Crop Revenue						
Crop	West	Central	South	East	North	Total
Field	82%	41%	22%	24%	28%	28%
Truck	10%	40%	62%	43%	22%	41%
Orchard & Vine	8%	20%	16%	33%	50%	32%
Total	100%	100%	100%	100%	100%	100%
Source: Delta Risk Management Strategy Phase 1 Draft Report 2007.						

⁴ Because geographically distributed data on livestock production was unavailable, the data in Table 9 exclude the value of livestock production.

Figure 5. Revenue Per Land Area for Typical Current Salinity Conditions



Source: Lund, et al. (2007), Figure 6.6, Page 121.

Regional Economic Impact of Delta Agriculture

Delta agriculture's contribution to state output, labor income, value added, and employment is summarized in Table 10.⁵ Based on 1998-2004 crop revenues, Delta agriculture generates nearly \$1 billion annually in statewide output. About 61% of this output represents value added to the state's economy, and about 35% constitutes labor income. Agricultural production in the Delta supports about 7,600 jobs statewide. Over 90% of the economic impact is associated with farm production in the southern, eastern, and northern parts of the Delta (Table 10). In addition to there being fewer acres under cultivation in the western Delta, an acre under cultivation has about 55% of the economic impact as an acre in the central Delta, and about 40% of the economic impact as an acre in the southern, northern, and eastern parts of the Delta (Table 10). Likewise, on a per acre basis, agricultural production in the southern, eastern, and northern parts of the Delta supports about 2.5 and 1.5 times the number of jobs as production in the western and central Delta, respectively (Table 10).

Table 10. Statewide Economic Impact of Delta Agriculture

Total (mil. \$)	West	Central	South	East	North	Total
Output	23	72	365	128	403	991
Labor Income	7	25	131	46	140	348
Value Added	13	44	233	80	242	613
% Total Impact	2%	7%	37%	13%	41%	100%
Jobs	164	530	2,606	982	3,286	7,567
\$/Acre	West	Central	South	East	North	Total
Output	1,108	1,895	2,711	2,682	2,505	2,466
Labor Income	339	647	972	951	872	867
Value Added	646	1,168	1,732	1,666	1,506	1,525
Jobs/acre	0.008	0.014	0.019	0.020	0.020	0.019

Source: Delta Risk Management Strategy Phase 1 Draft Report (2007).

Summary of Delta Agriculture

Based on the above data and discussion, the following summary points about Delta agricultural production are presented:

- Agriculture in the Delta generates approximately \$730 million in annual sales revenue (2007 dollars).
- Agricultural land uses in the Delta, especially in the central and western parts, are dominated by the production of field crops. Field crop production accounted for 70% of irrigated farm acreage during the period 1998-2004.
- While accounting for just 30% of irrigated acreage, truck and orchard crops (including seed and nursery), generate about 65% of farm revenues. Field crops

⁵ Value added is the sum of labor, proprietor, and property income plus indirect business tax receipts. It is a standard economic measure of the net economic contribution an activity makes to a region after accounting for imports and exports. Regional impact estimates were calculated using regional impact multipliers generated by an IMPLAN regional input-output model of the Delta region.

account for about 22% of farm revenues while animal husbandry accounts for about 13%.

- The southern and northern parts of the Delta produce over three-quarters of total crop revenue out of the Delta. In addition to having more acres under cultivation than other parts of the Delta, higher valued truck and orchard crops comprise a larger share of total crop acreage in these parts of the Delta.
- Soil quality, flood risk, and market constraints limit opportunities to expand production of high revenue-generating truck and orchard crops in the Delta. While production of higher revenue-generating crops in the Delta could be expanded, the risk of loss would likely outweigh the potential return.
- Based on 1998-2004 crop revenues, Delta agriculture generates nearly \$1 billion annually in statewide output – about 0.06% of 2005 gross state product. About 61% of this output represents value added to the state's economy, and about 35% constitutes labor income. Agricultural production in the Delta supports about 7,600 jobs statewide.
- Over 90% of the economic impact is associated with farm production in the southern, eastern, and northern parts of the Delta.
- On a per acre basis, agricultural production in the southern, eastern, and northern parts of the Delta supports about 2.5 and 1.5 times the value added and employment as production in the western and central Delta, respectively.

The Delta's Recreational Economy

The Delta provides a wide range of recreational opportunities, including fishing, hunting, boating, camping, picnicking, and nature viewing. With approximately 700 miles of navigable channels, it is one of the largest waterway complexes in the western United States.⁶ For boaters, the Delta offers a mix of broad, open channels suitable for water skiing and pleasure cruising, and smaller meandering channels, cloaked in riparian vegetation, ideally suited to house boating, swimming, and secluded picnics. The Delta provides world-renowned hunting, fishing, and nature viewing opportunities. The Pacific Flyway passes directly over the Delta. Waterways and islands provide habitat for 230 species of birds, 45 species of mammals, 52 species of fish, 25 species of reptiles and amphibians, and 150 species of flowering plants.⁷ The Suisun Marsh, the largest contiguous brackish water marsh remaining on the west coast, is home to 158 private duck clubs and a number of public waterfowl hunting areas, including the Grizzly Island Wildlife Area.⁸ The marsh also supports 80% of the state's commercial and recreational salmon fishery by providing important tidal rearing areas for juvenile fish.⁹

Visitor Days of Recreation

The Delta's proximity to the Bay Area and Sacramento region and its diversity of recreation settings and experiences makes it a popular recreation destination. Approximately 7 million people currently visit the Delta for recreation annually.¹⁰ By 2020, visitation is forecasted to reach 8 million visitor days.¹¹ According to a 1996 survey of recreation in the Delta conducted by the Department of Parks and Recreation (DPR), 23.5% of registered boat owners and 23.0% of licensed anglers in California recreated in the Delta in 1995.¹² The majority of Delta boaters and anglers come from nearby counties, but a sizable fraction come from much further distances. In 1995 Los Angeles County alone accounted for 7.3% and 3.6% of Delta boater and angler user days, respectively. Table 11 lists the top 10 counties of origin for Delta boating and fishing recreation.¹³

Table 11. Top 10 Counties of Origin for Delta Boating and Fishing Recreation

RANK	BOATERS	PERCENT	RANK	ANGLERS	PERCENT
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

⁶ <http://www.delta.ca.gov/delta.asp>

⁷ Ibid.

⁸ <http://www.iep.ca.gov/suisun/facts/index.html>

⁹ Ibid.

¹⁰ Wade, W. and J. Plater (2002).

¹¹ Ibid.

¹² 1997 Sacramento-San Joaquin Delta Recreation Survey; <http://www.delta.ca.gov/recsur.asp>

¹³ Ibid.

9	Solano	3.1	9	Stanislaus	3.1
10	San Mateo	3.0	10	Sonoma	2.0
Subtotal		66.3	Subtotal		60.4

People recreating in the Delta typically engage in more than one recreational activity. In recreational surveying, a user-day is counted for each activity a visitor participates in over the course of a day. Thus if a person visiting the Delta spent part of the day fishing and part of the day pleasure cruising, that would be counted as two user days of recreational activity. Surveys show that the Delta currently supports over 12 million user days of recreational activity annually.¹⁴ Table 12 shows the estimated number of user days occurring in the Delta, as derived from surveys of boaters and anglers.¹⁵

The 1996 DPR survey found that fishing from a boat was the number one recreational activity in the Delta among registered boat owners and licensed anglers. The majority of surveyed boat owners also reported using the Delta for pleasure cruising, swimming, and water skiing. Among licensed anglers, shore fishing and tournament fishing were also popular. Table 13 shows the most common boating and fishing activities reported by Delta boaters and anglers.¹⁶ The table also shows the top ten recreation activities after boating and fishing that survey respondents reported enjoying in the Delta. Because the DPR survey only included boat owners and anglers, survey results most likely under-represent the popularity of non-boating and non-fishing activities in the Delta, such as wildlife viewing, picnicking, land-based hunting, and hiking. Nonetheless, the Delta is primarily known as a boating and fishing recreation destination, and these two recreation activities account for the majority of recreation activity occurring in the Delta.

Table 12. Estimated Delta Boating and Fishing User Days

ACTIVITY	ESTIMATED NO. OF GROUPS	AVG. NO. OF DAYS PER YEAR	TOTAL GROUP DAYS	AVG. NO. OF PERSONS PER TRIP	ESTIMATED TOTAL USER 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

*User day estimates for boating and fishing cannot be added together because this would result in double counting. Double counting would occur because most boaters also fished and many anglers also boated..

Table 13. Favorite Recreation Activities Among Delta Boaters and Anglers

MAJOR BOATING AND FISHING ACTIVITIES					
RANK	BOATERS	PERCENT	RANK	ANGLERS	PERCENT
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			

¹⁴ http://www.delta.ca.gov/pdf/Delta_Fact_Sheet.pdf

¹⁵ <http://www.delta.ca.gov/delta.asp>

¹⁶ 1997 Sacramento-San Joaquin Delta Recreation Survey; <http://www.delta.ca.gov/recsur.asp>

7 Hunting from boat 5

TOP TEN ACTIVITIES AFTER BOATING AND FISHING

RANK	BOATERS	PERCENT	RANK	ANGLERS	PERCENT
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	Hiking	32	5	Hiking	39
6	Swimming from shore	30	6	Picnicking	37
7	Attend special events	28	7	Nature photography	25
8	Nature photography	21	8	Attend special events	25
9	RV camping	20	9	RV camping	23
10	Visit historical/cultural sites	18	10	Visit historical/cultural sites	23

Delta Recreation Facilities

Most recreation facilities in the Delta are provided by private marinas. There are approximately 100 marinas in the Delta and over 11,000 boat berths.¹⁷ The Suisun Marsh is home to 158 private duck clubs. There are an additional 19 private duck clubs in the rest of the Delta, mainly northwest of the Sacramento Deep Water Channel.¹⁸ There are 22 publicly owned recreation areas in the Legal Delta (Primary and Secondary Zones). These include federal, State, county, city, land trust, and port-run facilities. Additional public lands are also reserved for wildlife protection and preservation.¹⁹ Public facilities include the Brannan Island State Recreation Area (SRA), the Grizzly Island Wildlife Area, five DFG fishing access/launching facilities managed by Sacramento and Yolo Counties, and the FWS Stone Lakes Refuge. There are also public recreation facilities operated by the East Bay Regional Park District, San Joaquin County, and DWR, as well as a number of cities, including Antioch, Pittsburg, Rio Vista, West Sacramento, Sacramento, and Stockton. Figure 6 shows the location of public and private recreation locations in the Delta.

Delta Recreation Zones

Different parts of the Delta support and concentrate different types of recreational activity. Boating is concentrated in the western and central parts while hunting and wildlife viewing are concentrated in the Suisun Marsh and areas in and around the Yolo bypass. The DPR survey divided the Delta into six recreation zones, shown in Figure 7, as follows:

- North Delta (Zone A)
- Northwest Delta (Zone B)
- Central Delta (Zone C)
- West Delta (Zone D)
- East Delta (Zone E)
- South Delta (Zone F)

¹⁷ <http://www.dbw.ca.gov/PDF/DeltaAssessment-PDF/Chapter2/Chapter%202.pdf>

¹⁸ <http://www.delta.ca.gov/atlas/duckclub.pdf>

¹⁹ Delta Protection Commission (1994).

The Suisun Marsh was not part of the DPR survey and is not included in this classification, so it can be considered the seventh Delta recreation zone.

The Delta's recreation zones vary greatly in terms of the quality and character of the resource, their relative size, the number of existing navigable waterways, the number of facilities, and the number of expected users. The Department of Boating and Waterways (DBW) described the features of the six DPR zones as follows:²⁰

North Delta (Zone A). The North Delta encompasses the most northern reach of the Delta. It consists of the Sacramento River corridor from the cities of Sacramento and West Sacramento to the town of Courtland. It includes portions of Elk Slough and the northern extension of the Deep Water Shipping Canal, Lake Washington, and the Sacramento Water Lock. The estimated 2,617 acres of water surface in the zone translates to approximately 61 linear miles of navigable channels. The majority of these miles are in the Sacramento River corridor (31 miles), the Shipping Canal (9 miles), and Elk Slough (9 miles), with the remainder found along Steamboat Slough (12 miles). The inventory of recreation-related facilities in this zone includes approximately 20 facilities with eight located in Yolo County. The remaining facilities are in Sacramento County. There are eight marinas in this zone, providing a total of 988 boat slips.

Features of this zone include Discovery Park, (a Sacramento County regional water-oriented park), frontage along Old Town Sacramento (a State Historic Park), Raley Field (home of the River Cats, an AAA baseball team), the West Sacramento Waterfront Promenade, upscale residential development in the Pocket Area, remnant fruit packing and shipping facilities along the Sacramento River, the Clarksburg public boat ramp (operated by Yolo County), and the Stone Lakes National Wildlife Preserve. Much of the levee system along the Sacramento River and Elk Slough has "naturalized," with stands of cottonwood, alder, valley oak, box elder, and willow providing a scenic edge for water-based views. The North Zone could be considered the Sacramento region's gateway to the Delta. The stretch of the Sacramento River in this zone is an intensively used artery linking the lower Delta with the Old Sacramento vicinity and navigable waters upstream on the American and Sacramento Rivers.

²⁰ <http://www.dbw.ca.gov/PDF/DeltaAssessment-PDF/Chapter2/Chapter%202.pdf>

Figure 6. Recreation Sites in the Delta

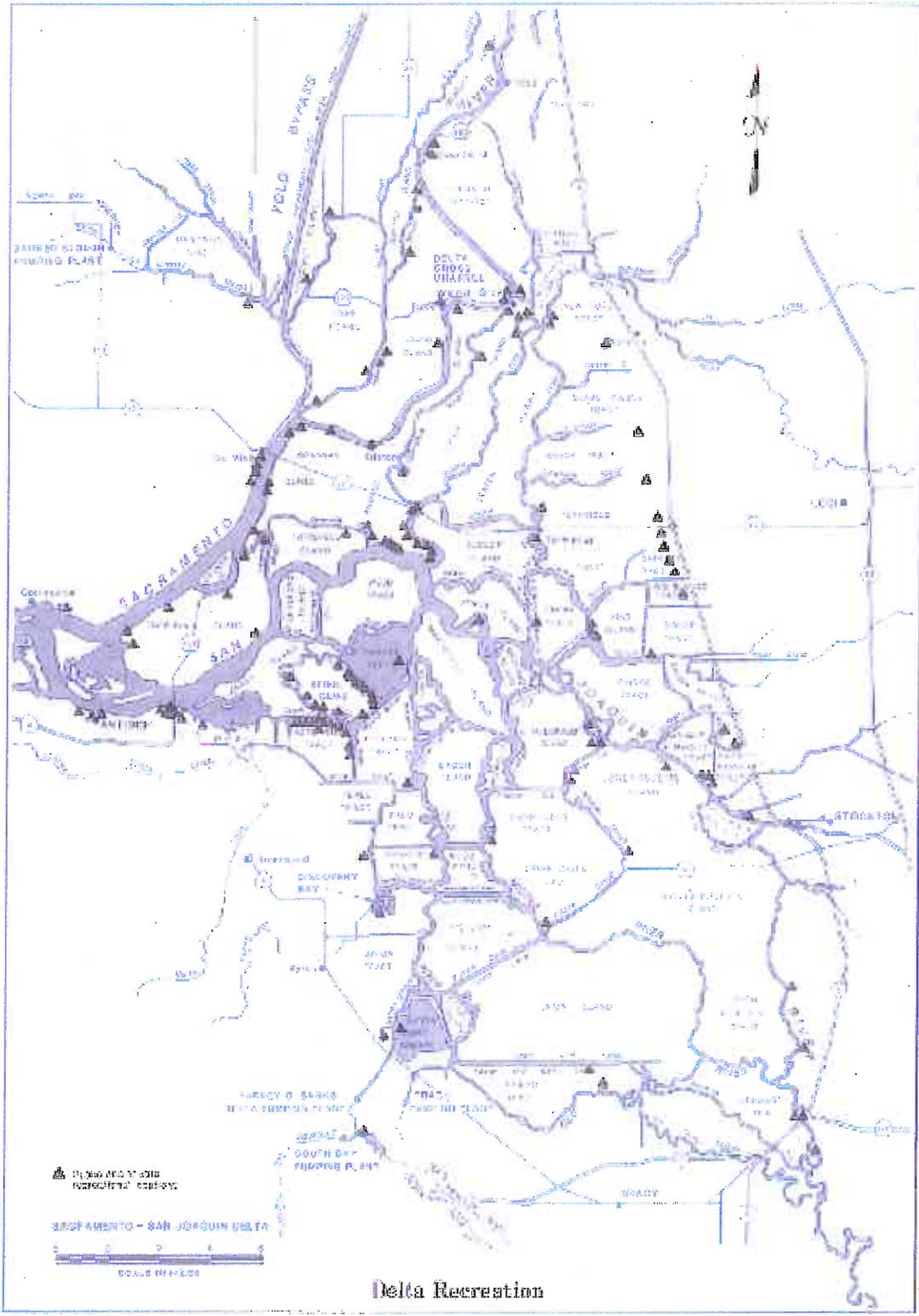
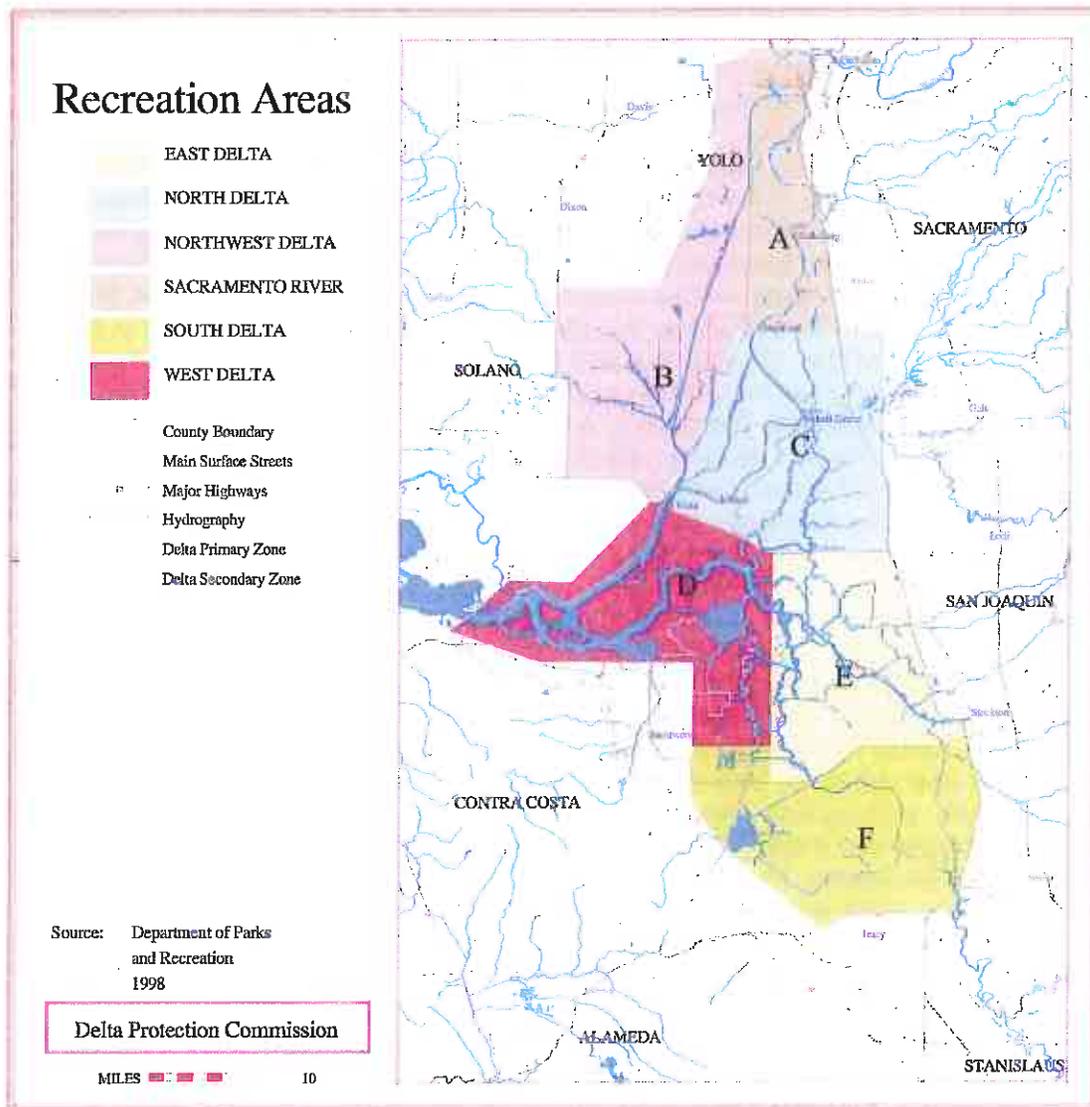


Figure 7. Delta Recreation Zones



Northwest Delta (Zone B). The Northwest Delta includes the Yolo Bypass, Cache Slough, and portions of the Sacramento Deep Water Shipping Canal. The town of Hood is located in this zone. The estimated 7,190 acres of water surface in this zone includes approximately 58 linear miles of navigable channels. The largest single block of these navigable miles is along the Shipping Canal (18 miles). The remainder of navigable miles is found within the shallow waters along Cache Slough and the adjoining channels in the Cache Slough system. The Yolo Bypass is the dominant element in this zone. The Yolo Bypass provides peak-flow flood area for the Sacramento River during the high-flow periods, allowing the floodwater to flow directly to the lower Delta. The zone is notable for extensive natural and restored habitat areas, including segments of Cache Slough, portions of Liberty and Prospect Islands, and the Vic Fazio Yolo Basin Wildlife area. This zone has relatively limited navigable waterways and minimal boating-related facilities. Drainages from Putah Creek, Willow Slough, and Haas Slough support

additional natural habitat areas. The primary recreation uses in the Northwest Zone are waterfowl hunting and wildlife viewing, with some fishing at the southern end of the zone. There are also a number of bike trails located in this zone. Although there are several recreation-serving facilities in this zone, these facilities primarily serve land-based activities, including duck hunting and wildlife viewing. There is only one marina facility in the Northwest Zone. It provides 76 boat slips.

Central Delta (Zone C). The Central Delta encompasses the north central part of the Delta. It includes portions of the Sacramento River, Miner Slough, Steamboat Slough, Sutter's Slough, Georgiana Slough, the north and south forks of the Mokelumne River, the Delta Cross Channel, Snodgrass and Lost Slough, and Beaver, Hog, and Sycamore Sloughs. The city of Rio Vista and the unincorporated communities of Courtland, Walnut Grove, Locke, Terminous, and Isleton are situated within this zone. To the east of this zone are the cities of Galt, Woodbridge, and Lodi. The estimated 5,552 acres of water surface in the Central Zone includes an extensive system of approximately 132 linear miles of navigable channels. The majority of these miles are along the Mokelumne River corridor (North and South – 36 miles), the Sacramento River corridor (23 miles), Steamboat Slough (13 miles), Georgiana (12 miles), and Snodgrass (9 miles). In some instances, as with the Georgiana Slough and North Mokelumne River, the waterways form circular loops for multi-route options. There are 12 marina facilities in this zone providing an estimated 1,271 boating slips. Additionally, there are numerous boating-associated facilities in this zone, including boat-accessed restaurants, resorts, and yacht clubs. The Consumnes River Preserve, the McCormack Tract, and the Delta Meadows (a California Department of Parks and Recreation facility) offer some of the most attractive natural areas with designated anchorages. These are also popular kayaking destinations. Sandy Beach Park is located on the Sacramento River near the town of Rio Vista. Open year round, the park offers a 24-hour boat-launching ramp, camp sites, picnic grounds, a hiking trail, miles of country roads for bicycling and a sandy beach stretching for over half a mile. Walnut Grove has developed a public dock to enable access to the community. The primary recreation uses in the Central Zone include boat cruising, fishing, water-skiing, boat camping, and sailing. Much of the levee system in this zone has been engineered with stone or rock slope protection, thereby creating a sterile appearance for the waterside environment.

West Delta (Zone D). The West Delta encompasses the western limits of the Delta and serves as the gateway to the San Pablo and San Francisco Bays to the west. The West Zone includes the lower Sacramento and San Joaquin Rivers. The highest concentration of marina facilities is located in this zone, as well as the greatest number of boats on the water. The channels tend to be broad in this zone and contain the largest ratio of water surface area compared with land surface, especially towards the western limits of the zone. The estimated 29,522 acres of navigable water surface in this zone includes approximately 152 linear miles of navigable channels. To a large extent, these miles occur within the main flow of the Sacramento River (22 miles), the San Joaquin River (28 miles), and Old River (14 miles). There are also many waterway connector channels linking the larger water bodies. The cities of Pittsburg, Antioch, Oakley, Byron, and Brentwood adjoin the zone, while the unincorporated community of Bethel Island is located entirely within the zone. Besides the lower reaches of the Sacramento and San Joaquin Rivers, this zone includes Old River and Middle River, as well as numerous minor channels and sloughs. A unique feature of the West Zone is the many inundated islands that have expanded the extent of water area and, in some instances, the range of navigable areas. These inundated islands include, Franks Tract SRA, Little Franks Tract, Lower Sherman Island, and Mildred Island. The extensive navigable waterways include many channels sufficiently wide for larger boats and sailing vessels. The West

Zone offers unique microclimate conditions that enable some of the best year-round conditions for windsurfing, sail-boarding, and sailing. These same winds tend to limit the amount of water-skiing and wakeboarding in the area, since participants in these activities typically prefer calm conditions. Because the West Zone is the primary transition area between the saline Bay waters and the fresh Delta waters, it is known to attract an abundance and diversity of fish, including striped and black bass, sturgeon, salmon, bluegill, and crappie. Other unique features of this zone include Brannan Island SRA, which includes Windy Cove day use access, public boat ramps, and over 140 campsites and areas for picnicking and swimming; Bethel Island (with the single highest concentration of boating-related facilities in the Delta); and Lower Sherman Island (a Sacramento County water-access area).²¹ There are 56 marina facilities in this zone, providing approximately 5,990 boat slips. Similar to the Central Zone, there are numerous boating-associated facilities in this zone. Also, like the Central Zone, the levee system in the West Zone has typically been engineered with stone or rock slope protection, creating a sterile appearance from the waterside environment.

East Delta (Zone E). The East Delta makes up the southeastern portion of the Delta. Bordered by State Route 12 on the north, Interstate 5 on the east, State Route 4 on the south, and a north-south line from Route 4 to Route 12 on the west, the estimated 7,560 acres of water surface in the East Zone includes approximately 122 linear miles of navigable channels. This zone contains the Delta Loop, a 10-mile scenic loop accessible by boat or car. The largest segments of these navigable miles are found along the main channel of the San Joaquin River (19 miles) and the Middle River (24 miles). The city of Stockton is the source for a significant number of users, as well as the economic hub that links agricultural, shipping, and recreation activities in the general vicinity. The San Joaquin River Shipping Canal traverses this zone from the northwest to the southeast. The Middle River also flows through this zone. Besides the main river flows, there are numerous channels and sloughs that define some of the higher-elevation islands, and dead-end sloughs that generally run easterly along the eastern border of the zone. The East Zone is considered a superior shore fishing area with many accessible connecting and dead-ended sloughs. It includes a number of private yacht club facilities – typically situated on vegetated islands along the larger channels. Mildred Island, a submerged island adjoining Middle River, has characteristics similar to Franks Tract SRA, with marginally navigable waters but reportedly very good fishing conditions. There are 13 marina facilities in the East Zone, offering 2,786 boating slips.

South Delta (Zone F). The South Delta encompasses the southern extent of the Delta. This area is bordered by State Route 4 to the north, Interstate 5 to the east, the Southern Pacific Railroad easement on the west side, and Interstate 205 to the south. The estimated 5,135 navigable acres of water surface in the South Zone includes approximately 110 linear miles of navigable channels. The majority of these miles are along the main channel of the San Joaquin River (15 miles), Middle River (24 miles), Old River (42 miles), Victoria Slough (12 miles), Woodward Slough (4 miles), and the navigable portions of Discovery Bay. The Clifton Court Forebay, the California Water Project's primary collection reservoir, is located in this zone. Discovery Bay, a water-oriented, residential development, where most houses front the water and have docks and boat slips, is located off of Old River and east of the community of Brentwood.

²¹ Access for windsurfers at Windy Cove was closed by the winter storms of early 2006. Windy Cove is currently open, but the access to the water has been fenced off. Re-establishing an access point at Windy Cove would likely be expensive due to engineering needed to build the access on unstable soil. There is still windsurfing access at Sherman Island (Sac County Parks), which is a few miles south on 160.

Situated on the lee side of the Diablo Range, this portion of the Delta tends to be the most sheltered in terms of wind exposure. This area tends to attract boaters drawn to quieter waters and engaged in activities such as water-skiing and fishing. There are presently five marina facilities in the South Zone, with approximately 563 boat slips provided. Old River, portions of Middle River, and the main San Joaquin channel flow through this zone. Because of the intake facility near Clifton Court Forebay, water flows are heavily regulated in this part of the Delta. Also, many of the channels in this zone have become impassable due to snags and vegetation encroachment. There are fewer boating and water-associated facilities in this zone in comparison to the adjoining zones to the north. Urban pressures are significant in this zone, with residential developments moving closer to the legal Delta Zone. The rapid population increases in residential pockets, such as Discovery Bay and the adjoining cities of Tracy, Byron, and Brentwood, suggests increased pressure on this part of the Delta for accommodating future recreation needs.

Table 14 provides a summary of characteristics and recreation features for each zone described above.²² Figure 8 shows the distribution of user days by recreation zone for (1) all boating activities, (2) fishing from a boat, and (3) fishing from the shore.²³ The highest levels of use for each activity occurs in the West Delta (Zone D), followed by the Central and East Delta (Zones C and E). The least amount of boating and fishing activity occurs in the Northwest Delta (Zone B).

Suisun Marsh. There is a scarcity of data on recreation occurring within the Suisun Marsh. It is a popular destination for waterfowl and game hunting, as well as fishing and wildlife viewing. It is also used extensively for dog training. Estimated recreation user-days by activity for Suisun Marsh are based on unpublished July 2005 to June 2006 visitor data for the Grizzly Island Wildlife Complex operated by Department of Fish and Game. These data were obtained during a telephone communication with the manager of the Grizzly Island Wildlife Complex, Pat Gramh, on November 16, 2006. Mr. Gramh used attendance records for the complex to estimate user-days by activity. He also provided the approximate percentage of total Suisun Marsh recreation this represented. The estimates are presented in Table 15.

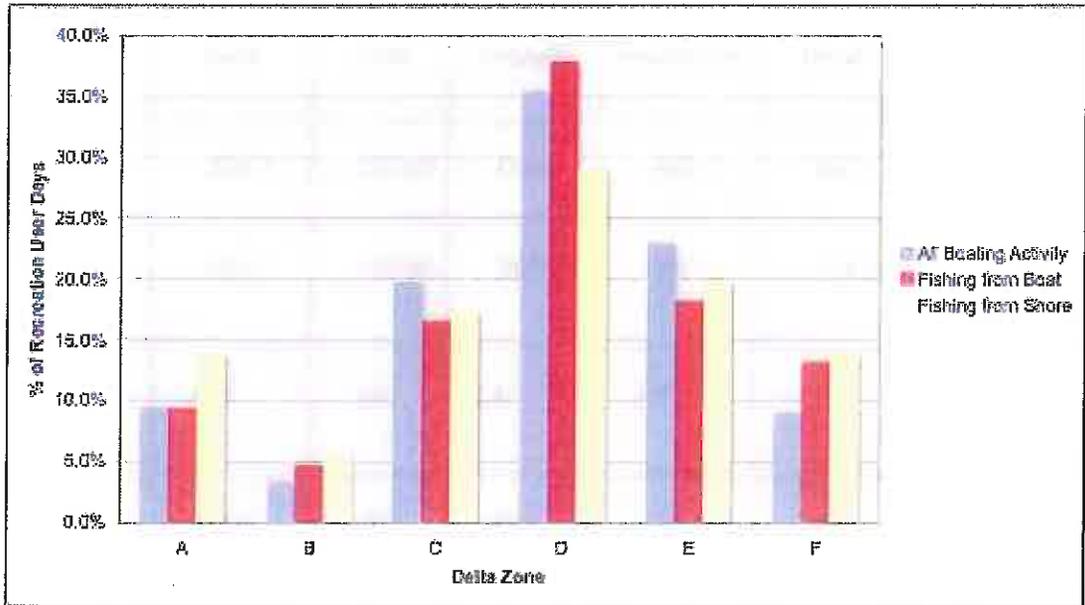
²² Ibid. Table 14 is a reproduction of Table 2-1 in Department of Boating and Waterways. "Sacramento-San Joaquin Delta Boating Needs Assessment: 2000-2020."

²³ 1997 Sacramento-San Joaquin Delta Recreation Survey; <http://www.delta.ca.gov/recsur.asp>

Table 14: Delta Recreation Zone Characteristics

	North	Northwest	Central	West	East	South	Total
Total Water Surface (acres)	3,145	7,545	5,915	29,995	7,840	5,255	59,795
Navigable Water Surface (acres)	2,617	7,190	5,552	29,522	7,560	5,135	57,576
Navigable Surface Area (sq. miles)	4.1	11.2	8.7	48.1	11.8	8.0	89.9
Linear Miles of Navigable Waterways	81	58	132	152	122	110	635
Number of Marinas ²	8	1	12	58	13	5	95
Boat Slips ⁴	988	76	1,271	5,990	2,786	563	11,674
Water Features	Major channels provide linkages to other zones, city of Sacramento	Yolo Bypass: flood structure, shipping canal, and extensive tidal margin lands	Many navigable channels – some circular – the Delta Cross-Channel	Gateway to San Pablo and San Francisco Bays, many inundated islands	Numerous main river flows, channels, channel islands, sloughs, city of Stockton	Sheltered & quiet waters, Clifton Court Forebay, regulated water flows, many congested channels	
Typical Types of Recreation	Cruising, fishing, and channel exploring	Mostly land-based hunting and wildlife viewing	Cruising, fishing, water-skiing, camping, sailing	Wind-surfing, sailing, fishing	Fishing, sailing	Water-skiing, wake-boarding, fishing	
Unique Characteristics	Discovery Park, Old Sacramento, Stone Lakes Wildlife Preserve	Extensive natural and restored habitat areas	Consumnes River Preserve, Delta Meadows	Brannan Island, Bethel Island, Big Break Interpretive area	Mildred Island, several yacht clubs	Discovery Bay, many areas sheltered from wind by Diablo Range	

Figure 8: Distribution of Boating and Fishing User Days by Delta Zone



Source: Delta Risk Management Strategy Phase 1 Draft Report 2007.

Table 15. Estimated Suisun Marsh Recreation User Days

Activity	Grizzly Complex	% of Marsh Total	Total Suisun Marsh
Wildlife Viewing, Dog Training, etc.	12,500	100%	12,500
Fishing	30,000	65%	46,154
Waterfowl hunting	6,000	*	67,620
Pheasant hunting	1,300	75%	1,733
Elk	40	100%	40
Pig, Rabbit	125	100%	125

* Private clubs in Suisun Marsh = 158 clubs x 10 hunters/day x 3 days/wk x 13 wks = 61620; Estimation method independently proposed by Pat Gramh and Steve Chappell of the Suisun Resource Conservation District.

Source: Telephone communication with Pat Gramh, Grizzly Island Wildlife Complex

Recreational Expenditures

People coming to the Delta to boat, fish, or engage in other recreational activities support the Delta economy through their expenditures for food, lodging, services, and supplies. The DPR survey estimated that in 1995 boaters spent on average \$183 (adjusted to 2006 dollars) inside the Delta per boat trip, while anglers spent on average \$147 per trip. Estimated expenditures within the Delta by boaters and anglers in 1995 were in excess of \$326 million (2006 dollars).²⁴ Delta recreation also benefits the rest of California’s economy. In addition to money spent inside the Delta, the DPR survey found that Delta boaters and anglers spent on average \$126 and \$163, respectively, per trip on businesses outside the Delta. Estimated recreation expenditures in 1995 by

²⁴ Goldman, G., et al., (1998)

Delta boaters and anglers benefiting businesses located outside the Delta were in excess of \$270 million. Thus, total Delta boater and angler recreation expenditures benefiting California businesses were estimated to exceed half a billion dollars in 1995. Table 16 provides a breakdown of Delta recreation expenditures estimated by the DPR survey.

Table 16. Delta Recreation Expenditures in 1995

Activity / Expenditure	Average Expenditure Per Trip (2006 \$)		Estimated Expenditures for All Trips in 1995 (2006\$)		Total Annual (2006 \$) 1000 Dollars
	Inside Delta Dollars	Outside Delta Dollars	Inside Delta 1000 Dollars	Outside Delta 1000 Dollars	
Boating					
Lodging	31.55	16.62	56,306	29,660	85,966
Food	50.25	31.71	89,690	56,588	146,278
Supplies	68.26	53.08	121,824	94,731	216,555
Recreation	32.83	24.90	58,591	44,433	103,024
Total Boating	182.89	126.31	326,411	225,412	551,823
Fishing					
Lodging	39.76	43.23	66,499	72,306	138,805
Food	39.27	37.24	65,682	62,282	127,964
Supplies	41.07	54.30	68,685	90,828	159,513
Recreation	26.70	27.97	44,664	46,783	91,447
Total Fishing	146.80	162.74	245,530	272,199	517,729
*Note that total expenditures for boating and fishing cannot be added together. Adding would result in double counting because many registered boaters are licensed anglers and vice-versa. The total annual expenditure estimates therefore provide a lower-bound estimate of recreation spending in the Delta.					

Regional Economic Impacts

Using impact multipliers for Delta recreation expenditures estimated by UC Berkeley economists in 1998, the Delta Risk Management Study estimated the economic impact of current Delta recreation levels.²⁵ Impacts were divided according to whether trip expenditures occurred within or outside the Delta. Impacts to economic output, income, value added, and employment are summarized in Table 17. Because the surveys upon which the impact estimates were based only counted boaters and anglers, and only if they were registered and licensed, the authors of this report consider the impact estimates to be lower bounds of actual economic impacts resulting from Delta recreation. Other popular Delta recreation activities, such as hunting, wildlife viewing, sightseeing, windsurfing, biking and camping also produce economic benefits to the region and state.

²⁵ Ibid.

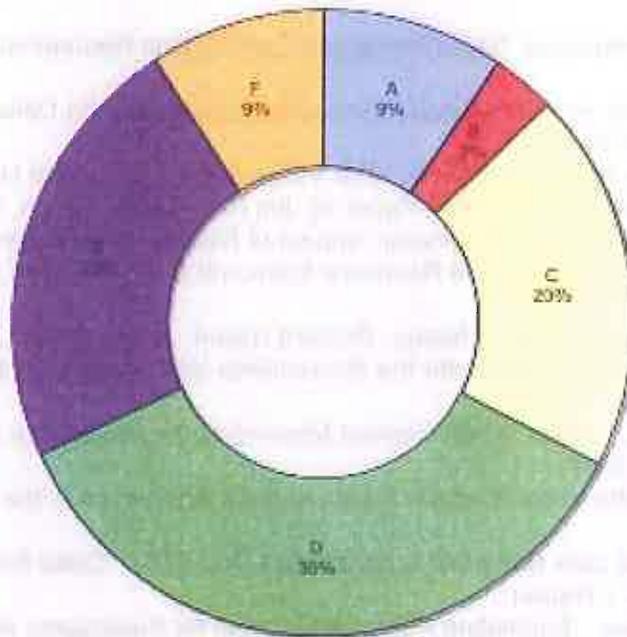
Table 17. Economic Impact of Trip Expenditures for Delta Recreation

Impact of Trip Expenditures Occurring Within Delta (Million \$)				
Sector	Output	Income	Value Added	Jobs
Lodging	120	49	73	1,568
Food	185	67	100	2,958
Supplies	247	108	166	2,806
Recreation	118	54	83	2,163
Total	671	277	422	9,495
Impact of Trip Expenditures Occurring Outside Delta (Million \$)				
Sector	Output	Income	Value Added	Jobs
Lodging	75	31	48	762
Food	133	52	78	1,806
Supplies	194	86	141	2,836
Recreation	104	43	65	1,843
Total	506	212	332	7,248
Total Impact of Trip Expenditures (Million \$)				
Sector	Output	Income	Value Added	Jobs
Lodging	196	79	121	2,331
Food	319	119	177	4,764
Supplies	441	193	307	5,642
Recreation	222	97	148	4,006
Total	1,178	488	753	16,742

For the state as a whole Delta recreation contributed approximately \$1.2 billion dollars (2006 dollars) to the California economy and supported approximately 17,000 jobs. Approximately 57% of the total economic impact is associated with within Delta recreational expenditures.

Based on the distribution of recreation visitor days shown in Table 8, recreation in Zone D provides the greatest contribution to economic impact (36%), followed by Zones E and C, at 23% and 20%, respectively (Figure 9). Zones A and F each account for about 9% of the total economic impact, while Zone B accounts for only 3%.

Figure 9. Share of Regional Economic Impact by Delta Recreation Zone



Summary of Delta Recreation

Based on the above data and discussion, the following summary points about Delta recreation are presented:

- Approximately 7 million people currently visit the Delta for recreation annually. By 2020, visitation is forecasted to reach 8 million visitor days.
- Recreation in the Delta generates approximately \$1.2 billion in annual economic activity (2006 dollars) and supports approximately 17,000 jobs statewide. About 55% of this economic impact is associated with expenditures for recreation inside the Delta, while 45% is associated with expenditures during travel to get to the Delta.
- Expenditures within the Delta for food, lodging, supplies, and recreation support over 9,000 jobs and generate approximately \$670 million in economic output.
- Boating and fishing are the most popular recreational activities in the Delta. Other popular recreation in the Delta includes hunting, sightseeing, picnicking, and windsurfing.
- Different parts of the Delta serve different recreational interests. The western Delta (Zone D) receives the most boating and fishing visitor-days, followed by the central and eastern Delta (Zones C and E). The northern part of the Delta (Zones A and B) are popular hunting destinations, as is the Suisun Marsh.
- Delta recreational zones C, D, and E account for almost 80% of recreation-related economic activity generated in the Delta.

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ATTACHMENT 1: Estimated Delta Island/Tract Crop Acreage

The Delta island/tract crop acreage estimates in this attachment were compiled for the Delta Risk Management Strategy Phase 1 report. The data are based on DWR crop acreage surveys of the Delta conducted in the 1990s as compiled by researchers at UC Davis. Because the UC Davis data set did not have acreage estimates for every island or tract in the Delta, it was combined with the DWR county-level acreage estimates reported in DWR (2006). The island/tract-specific acreage estimates from UC Davis were subtracted from the appropriate county-level acreage estimates and the residual crop acreage was then allocated to islands/tracts for which estimates were not available in proportion to their total irrigated acreage. This resulted in a rough estimate of crop acreage by island/tract that, when aggregated by county, corresponds to the county-level crop acreage estimates in DWR (2006). The island/tracts listed in Attachment 1 follow the geographic boundaries defined in the Google Earth file: "Analysis_Zones_121606_clipped_with_waterzones.kmz," which accompanies this memorandum.

