

*BAY-DELTA OVERSIGHT
COUNCIL*

DRAFT

**BRIEFING PAPER
ON THE IMPACT
OF OUTDOOR RECREATION
ON THE LEVEES AND
NATURAL RESOURCES OF
THE SACRAMENTO-SAN JOAQUIN DELTA**

Bay-Delta Oversight Council

December 1994

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THE SACRAMENTO-SAN JOAQUIN DELTA**

**BAY-DELTA OVERSIGHT COUNCIL
DECEMBER 1994**

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PREFACE

This briefing package is intended to provide additional information regarding impacts of outdoor recreation on the levees and natural resources of the Sacramento-San Joaquin Delta. This information is supplemental to that presented in previous draft briefing papers prepared for BDOC.

The Executive Summary seeks to provide an overview of the information presented in the briefing paper. It deserves emphasis, however, that it should not be considered a substitute for the full text. Rather, it is intended to provide merely a snapshot of the major points, as the characterization and flavor of the entire prepared document cannot be replicated in an Executive Summary.

As has been our practice, attached as addenda are several perspective papers outlining the peer reviewers' views pertaining to the issues discussed in this briefing paper. These perspective papers are reproduced exactly as submitted.

THE IMPACT OF OUTDOOR RECREATION
ON THE LEVEES AND NATURAL RESOURCES OF
THE SACRAMENTO-SAN JOAQUIN DELTA

Prepared for the
Bay-Delta Oversight Council

Main Briefing Paper Prepared

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Executive Summary prepared

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EXECUTIVE SUMMARY

INTRODUCTION

The Bay-Delta Oversight Council (BDOC) was established to oversee the development of solutions to long standing problems of the Bay-Delta Estuary. Specifically, the Council will address water quality concerns, effective design and operation of water export systems, maintenance of Delta levees and channels, and guarantees for protection of fish and wildlife resources. The Council has not been given the specific mission of promoting recreation in the Delta. However, some of the BDOC solutions which may be chosen to address problems in the Delta may exacerbate certain recreational impacts or conflict with recreation proposals by local, State, or Federal agencies. Therefore, consideration must be given to recreational impacts in order to implement fully effective BDOC solutions.

The Delta, because of its unique waterway system (featuring 1,100 miles of shoreline, 50,000 acres of water surface, and hundreds of islands), is one of the most popular destinations for outdoor recreation in California, particularly for boating and fishing enthusiasts. The combination of open waterways, secluded, narrow, winding sloughs with overhanging riparian vegetation, convenient location and temperate climate all provide the public with a diverse assortment of recreation opportunities.

Another reason for the Delta's high level of recreational use is its close proximity to several large and expanding urban population centers. In 1990, the population of five counties adjoining the Delta (Contra Costa, Solano, Alameda, Sacramento, and San Joaquin) totaled 4 million people. This population is expected to increase to 5.2 million by the year 2005.

RECREATION IN THE DELTA

Present Recreation Uses

Recreation in the Delta is primarily water-dependent and many of the recreation areas are only accessible by boat, limiting their use by the general public. The location of various recreation facilities in the Delta are identified in Figure 1 in the main report.

Most public land in the Delta is managed primarily to protect and enhance wildlife resources. To the extent that such management conflicts with recreation, current and potential recreational opportunities may be limited.

Water-Based Recreation Activities

Boating. The Delta is one of the finest recreational boating locales on the west coast, where almost every type of recreational boating activity can be found. About half of all recreation in the Delta involves boating. Most recreational boaters seem to prefer the central and northern portions of the Delta. Boating is a year-round activity, although it does decrease during the winter months.

Other popular forms of water-dependent recreation include houseboating, sailing, boat fishing, jet skiing, anchoring, water skiing, canoeing, kayaking, bank fishing, and windsurfing.

Land-Based Recreation Activities

Not all recreation activities in the Delta are associated with water. The more popular land-based recreation activities include hunting, camping, picnicking, hiking, horseback riding, bicycling, bird watching, nature study, sightseeing and special events.

ECONOMIC IMPACT OF RECREATION

Recreation and related support services are the third largest contributor after agriculture and natural gas exploration to the Delta economy.

Current information on the economic impact of recreation on communities in and around the Delta is scarce. In 1982, the Assembly Office of Research estimated that recreation contributed \$73.6 million annually to the regional economy. (This amount was based on an estimated 11.9 million annual recreation days, and an estimated expenditure of \$6.18 per recreation day.)

The Department of Parks and Recreation conducted a survey of the expenditures of recreationists at Brannan Island SRA in 1994. The preliminary results of this investigation indicate that visitors to this SRA spent an average of \$10.23 per day while recreating in the Delta. The final report should be available in early 1995.

PAST TRENDS IN RECREATION

In general, basic recreation activities in the Delta have changed little over the last 20 years. Based on existing recreation studies, participation rates for boating, fishing, water skiing, houseboating, and camping have remained relatively constant. Jet skiing and windsurfing are the most recent additions to the recreation menu and appear to be growing in popularity.

The houseboat rental market has declined in recent years. However, this decline is probably due to current economic uncertainty and a recent change in federal tax policies that make houseboat rentals less profitable.

FUTURE TRENDS IN RECREATION

Envisioning future recreation trends in California has always been difficult. In the 1990s, recreation planners are confronted by the challenge of meeting the growing recreational demands of California's diversifying culture despite shrinking management resources.

Considering the inaccuracy of previous predictions, any assessment of future recreational trends in the Delta should be viewed with some skepticism. As the population of counties adjoining the Delta increases, so will recreation demand. However, public recreation areas and facilities in the Delta needed to meet the projected demand may not be provided. In addition, the lack of public funds will force government agencies to continue to rely on revenue-generating facilities and services at existing and any proposed recreation areas. Consideration of these issues is necessary in determining future recreation opportunities in the Delta.

FUTURE RECREATION OPPORTUNITIES

Public Recreation Opportunities

Existing public recreation areas and facilities in the Delta are insufficient to meet current and future recreation demand. Of the 56 potential recreation sites identified in DWR's 1981 Delta Outdoor Recreation Implementation Plan, very few have been developed. Considering the lack of funds available to public agencies, the prospect of providing adequate additional public recreation opportunities in the immediate future seems remote. There are a few potential projects, however, proposed by the Department of Water Resources, the Department of Parks and Recreation and the US Fish and Wildlife Service which may be feasible in the near term.

Private Recreation Opportunities

Delta recreation is heavily dependent upon private marinas with boat launching ramps, campgrounds, and related support facilities. A recent study prepared by the Delta Protection Commission (Recreation and Access Study, 1994) indicated, because of leasing and permitting difficulties, few marina owners expressed a desire to expand their facilities. In recent years, several proposals for new marinas have been submitted to government agencies for consideration, but few have actually been constructed due to funding, permitting, or economic reasons.

CURRENT RECREATION PLANNING EFFORTS

State and local Recreation planning in the Delta has been described as haphazard and uncoordinated. Local recreation planning, and all other land-use planning, is typically a county responsibility. Each of the five Delta counties has adopted a General Plan; however, there is little planning coordination among the counties, and each county addresses Delta recreation issues differently.

Besides the five counties, agencies of the state and federal governments exercise significant control over the Delta through various regulatory processes. Serving different mandates and constituencies has led, however, to many of these agencies acting inconsistently with the counties, and each other. In addition, planning efforts are affected by funding and perceived territorial issues. As a result, recreation planning, at the state and federal level, as well as the local, is not successfully coordinated.

Local Recreation Planning

Although each of the Delta counties has adopted a General Plan, including an open space and/or recreation element, each county's approach to planning varies. In addition to the counties, many cities and communities in or near the Delta also have adopted General Plans with open-space and/or recreation elements.

In 1985, a joint Delta Advisory Planning Council formed by the five Delta counties adopted a set of land use guidelines for the Delta. The council proposed regulating certain areas to minimize impacts on wildlife habitat, use of speed zones to restrict boating activity in certain areas, and development of a special signage program for recreation land and facilities in the Delta. Although these proposals were not implemented, the DAPC was the predecessor of the Delta Protection Commission.

The Delta Protection Commission is updating their recreation and access study for the Delta. As a result of this study, policies adopted by the Commission will become part of a new Delta Regional Plan, which would then be incorporated by the five Delta counties general plans to guide future recreational and public access planning and development.

State Recreation Planning

As of 1991, public agencies have spent more than \$1 million preparing major reports on Delta recreation planning. The majority of these reports have been prepared by state agencies including the State Lands Commission, the Resources Agency, and the Departments of Fish and Game, Water Resources, and Parks and Recreation. A comprehensive list of relevant State planning documents is provided in Table 1 located in the main report. As discussed earlier, these reports were developed independently by various agencies occasionally resulting in conflicting proposals.

CURRENT REGULATIONS

The Delta is regulated by a bewildering maze of local, state, and federal agencies, representing often conflicting and competing interests. There are currently no state or regional provisions to resolve conflicts or inconsistencies between local, state, or regional plans. Consequently, there are no clear, consolidated Delta-wide policies to regulate the placement of recreation facilities or control recreation activities in the Delta.

MAJOR RECREATION ISSUES

IMPACT OF RECREATION ON LEVEES

Levee Inspection Efforts. Reports and studies often cite marinas located adjacent to levees as impediments to inspection efforts. However, many marina improvements are located on the waterside of the levee, thereby obscuring only that small portion of the levee between the water line and the top of the levee. Also, marinas occupy a very small area when compared to the entire 1,100 miles of leveed shoreline. Anglers parking in front of levee access gates are a problem according to one levee inspector. When these vehicles block access to the levee service road, the inspectors cannot do their job in a timely manner.

Flood fighting Efforts. During major floods, boats and other floating debris from marinas may break free and block bridge openings, exacerbating flood danger. Marina structures and facilities are also cited as potential impediments to fighting floods.

Levee Maintenance Efforts and Costs. The perception that levees near marinas are more time-consuming and expensive to maintain may arise from the concentrated use of levees near marinas. Recreationists camping on Delta levees, berms, and revegetation sites has also been cited as a cause of increased maintenance costs.

Erosion Due to Boat Wake. Levee erosion caused by the wake of passing powerboats is one of recreation's biggest impacts on the Delta. Because of this erosion, boats are cited as sources for both declines in wildlife habitat and increases in levee maintenance costs. In 1971, in response to these concerns, the Department of Boating and Waterways (DBW) hired a private consultant to study this problem. In 1975, the Department of Water Resources (DWR) released a similar study, also prepared by a consultant.

Although the findings of both studies were inconclusive, and both indicated additional study is needed, boats are a visible source of levee erosion. It is that visibility which may account for the apparently disproportionate amount of blame attributed to boat wake considering the studies cited above.

Disturbance to Levees and Berms. Recreationists, especially anglers who drive, walk, or camp on unprotected levees and berms, can disturb the soil and accelerate slope erosion. Also, anglers sometimes damage levees by removing protective rock (rip-rap) for use as campfire rings, to construct small wind shelters, or to roll into the water to create personal fishing platforms.

IMPACT OF RECREATION ON DELTA WATERWAYS

Reduced Public Access to Waterways. Development of recreation facilities such as marinas, yacht clubs, and duck clubs can restrict the public's access to Delta waterways. Although only a few miles of leveed shoreline are used for marinas any loss of public access must be considered important, since public lands are such a small fraction of the hundreds of miles of shoreline.

Besides structures on the shore, structures in Delta waterways can also impede public use. In 1981, the US Army Corps of Engineers identified approximately 200 known illegal structures in the water, including private slalom courses, ski jumps, and docks.

Boating Safety. For many years, some Delta user groups have expressed concern over the seemingly high number of boating accidents in the Delta, citing the use of alcohol, operator inexperience or ignorance, and excessive speed as probable causes. Other problem areas mentioned were concentrated boating activity near blind bends, excessive boat wakes, dangerous intersections, narrow channels, and conflicts between various types of boating activities.

As part of Department of Boating and Waterway's 1985 study on boating safety in the Delta, the following actions were recommended: 1) state and local agencies should do more to emphasize boating safety education and enforcement; 2) all buoys, waterway markers, information signs, and control zones should be uniform; 3) state and local agencies should do more to inform the boating public of safety problems unique to the Delta, such as merging channels and blind intersections; and, 4) require every person who is convicted of a boating violation to pay a fine or complete a boating safety education course.

Conflicting Water Activities. Recreational use of Delta waterways is essentially unregulated. As a consequence, there are many conflicts between various recreational uses on Delta waterways. The result of these conflicts can range from a spoiled recreation experience to property damage or even serious injury. Another problem can be displacement of passive recreation by active recreation. Typically, active recreation involving fast and/or noisy watercraft will drive away or displace more passive forms of recreation such as fishing or wildlife viewing.

IMPACT OF RECREATION ON PUBLIC AND PRIVATE LANDS

Encroachment on Public Lands. Some of the higher non-leveed channel islands are occupied by squatters claiming ownership and preventing public use.

Trespassing on Private Property. Recreationists frequently trespass on private property. Property owners have complained of noise from boats and jet skis, and loss of privacy.

Vandalism. Some reclamation districts complain that vandals will shoot up signs, tear down fences (wooden fences are used for firewood), damage outbuildings (shoot out windows and strip off wood for campfires), remove rip-rap from levees and break into water stage recording stations.

Fires. It is estimated that unattended campfires cause about 10% of the wildfires in one reclamation district. Many fires originate along public roads, where some are caused by careless motorists, while others are intentionally set.

Off-Road Vehicles. Recreationists using off-road vehicles occasionally damage agricultural lands and revegetation sites.

Increased Maintenance Costs. Property owners responsible for maintaining the Delta's levee system complain about having to pay for erosion damage caused by boat-wake. Damage caused by a trespasser's carelessness or vandalism is an additional expense for the property owner.

Litter and Trash. Litter and trash are a common problem in the Delta. The few public recreation facilities are so far apart, and public agencies have such limited maintenance staff and equipment, that trash collection is often inadequate. It should be noted, however, that dumping of household garbage may be responsible for much of the trash found in the Delta.

IMPACT OF RECREATION ON FISH, WILDLIFE AND RIPARIAN HABITAT

The Delta's enduring attraction for recreation purposes is closely linked to protection and management of both fish and wildlife. Riparian habitat plays an important role in this effort. Not only does it sustain the fish and wildlife that are an essential part of the Delta recreation experience, it also provides an aesthetic attraction.

IMPACT ON FISH

Delta fish are affected by a number of factors, including water export operations, Delta agricultural water diversions, changes to the food chain caused by non-native aquatic species, poor water quality, and legal and illegal harvest.

Recreation exacerbates some of these problems. Facilities, boat maintenance, and waste dumping contribute to water pollution and water quality degradation. Recreational fish harvest sometimes includes illegal take and is a factor in fish management decisions.

Water Pollution. Fueling accidents, leaky tanks and lines and carelessness allow spilled oil, diesel, and gasoline into Delta waters. Paint and toxic anti-fouling chemicals contaminate many marinas and spread into the Delta, often in significant concentrations. California has prohibited use of anti-fouling paint since 1988.

Boats in California are required to have proper sewage disposal equipment; however, few marinas are equipped with sewage pump out facilities, or use proper handling methods. Some contend that untreated sewage in the Delta waters may be more of a health threat to swimmers than to fish.

Recreational Fishing. Fishing, both legal and illegal, affects the Delta's biological resources. The reader is referred to the fish harvest briefing paper being prepared by BDOC for detailed information on this subject.

IMPACT ON WILDLIFE

Some Delta recreation activities, such as hunting, bird watching, and nature studies, are directly dependent on the quantity and quality of wildlife.

Unauthorized construction of recreation facilities in waterways and on some channel islands is also a problem. Neither the Corps of Engineers, the State Lands Commission, nor the counties are able to actively inspect and abate these violations. This construction adversely affects wildlife habitat areas, and it precludes use of some areas by the public.

Human Noise and Activity. There seems to be little information available regarding the impact of human noise and activity on wildlife. Some Delta wildlife is easily disturbed by human activity. In other cases, it appears that Delta wildlife may be fairly adaptable to human activity.

Litter. Litter can be injurious or even deadly to wildlife if it is mistaken for food, or if birds or mammals become entangled in it.

Hunting. Hunting in the Delta is carefully regulated to prevent serious threats to overall population survival. Illegal hunting has not been determined to be a serious problem.

IMPACT ON RIPARIAN HABITAT

Riparian habitat confers on the Delta its characteristic aesthetic quality while also sustaining fish and wildlife. In addition, it often provides shelter to boaters, campers and other recreationists.

The Delta Recreation Master Plan (1976) identified some adverse environmental effects of recreation on Delta habitats: 1) trampling and destruction of vegetation; 2) occasional vandalism; 3) litter accumulations which can injure fish and wildlife; 4) occasional uncontrolled fires (including peat) caused by careless smokers, off road vehicles, campfires and arsonists; 5) localized and increased traffic into natural areas; and, 6) air pollution.

Habitat loss also results from other activities, such as conversion of Delta land to residential development and camping in revegetation areas.

Boat-Wake. Boat-wake, as previously discussed, is a contributing cause of levee erosion, which can result in loss of wildlife habitat.

Fires. Occasionally, a campfire will get out of control, destroying some of the surrounding riparian habitat. Damage caused by anglers and campers seeking firewood, however, may be a greater long-term threat to riparian habitat than occasional wildfires.

Off-Road Vehicles. Some recreationists using off-road vehicles damage agricultural land, berms, revegetation sites and associated habitat but it is not considered a wide-spread problem.

INTERRELATIONSHIPS

Interrelationship Between Recreation and Agriculture.

Recreation and agriculture compete for the Delta's limited supply of land. The desire to preserve existing agricultural land is well established. However, proposals to provide for additional public access to Delta waterways, and to provide for additional recreational areas and facilities, may make it necessary to acquire additional agricultural land.

The interrelationship between recreation and agriculture can be mutually beneficial. Recreationists who belong to hunting clubs benefit from the use of private agricultural lands, while landowners benefit from hunting fees, which can be used to offset the cost of recreation-induced expenses such as replacing rip-rap.

Interrelationship Between Recreation and Fish and Wildlife.

The Delta's diverse fish and wildlife resources provide varied recreational opportunities which in turn benefit those resources. Duck and pheasant clubs, which are managed to attract game birds, also provide food and cover for non-game birds and other wildlife. Bird watching and nature study are non-intrusive activities which also increase the public awareness for protection and enhancement of habitat and wildlife values.

Interrelationship Between Recreation and Riparian Habitat.

Riparian habitat is not only essential for wildlife, it also provides natural shade for boaters and campers. Some tall vegetation is essential for shaded riverine aquatic habitat. Recreationists, however, who trample vegetation and cut trees for firewood are a threat to riparian habitat.

Interrelationship Between Recreation and the Local Economy.

The relationship between local residents and recreationists can be mutually beneficial. Goods and services provided by local merchants can be an essential element of a good recreational experience. Income generated from recreationists supports local economies and provides jobs. Some local residents complain that visitors litter the countryside, clog local highways, tax local services, and inflate local prices.

Interrelationship Between Recreation and Private Property Rights.

The relationship between recreationists and property owners is often one marked by resentment and frustration. Property owners often resent the invasion of privacy and damage caused by the trespassers. They are also frustrated over the inability of the government to resolve the problem. Recreationists are often equally frustrated over the lack of public parking along levee roads, the lack of legal access to waterways, and the lack of public recreation facilities in the Delta.

Interrelationship Between Recreation and Flood Control.

For many years, recreationists have benefited from the recreation benefits afforded by Delta levees which were constructed and are maintained as flood control elements. Construction of recreation facilities, such as marinas and boat launch ramps does not seem to have a significant impact on the levees' flood control function. However, the presence of large numbers of recreationists, and the associated recreational facilities increases the potential flood losses, complicates evacuation procedures, and adds to the costs of levee maintenance.

Interrelationship Between Public and Private Recreation.

There are few public waterways in California where there is so much recreation and so few public facilities. In the Delta, the private sector, not the government, is the primary supplier of publicly accessible recreation facilities and services.

Interrelationship Between Recreation and Other Delta Resources.

Most proposals to increase recreational activity have a direct or indirect negative impact on biological or agricultural resources and may impact flood protection. Conversely, efforts to improve some other Delta resources could have a negative impact on recreation.

RESOURCE MANAGEMENT ISSUES

Resources management issues affect the impacts of recreation on levees, waterways, public and private lands and biological resources (fish, wildlife and riparian habitat). Some of these issues could affect the ability of proposed solution actions to successfully address problems within the BDOC mission. For instance, actions proposed to address levee and channel issues may not be fully effective unless the impacts related to recreational activities are considered in those actions. Some of the BDOC solution actions which may be chosen to address Delta resource issues may also exacerbate the recreational impacts described in this paper.

As a consequence of the interrelationships between Delta recreational impacts and the effectiveness of some of the solution options, the combinations of solution options which are developed for the Estuary will need to carefully consider methods which address the impacts of recreation on resources. A full discussion of these relationships is presented in the main body of this paper.

Introduction

INTRODUCTION

The Delta, because of its unique waterway system (featuring 1,100 miles of shoreline, 50,000 acres of water surface, and hundreds of islands), is one of the most popular destinations for outdoor recreation in California, particularly for boating and fishing enthusiasts.

Since the 1960s, environmentalists, local landowners, and government agencies have been concerned about the impact of outdoor recreation on the Delta's natural resources, levees, and agricultural businesses. The more common complaints include trespassing, vandalism, fires, levee erosion caused by boat wakes, and loss of fish, wildlife, and riparian habitat.

The Bay-Delta Oversight Council (BDOC) was established to oversee the development of solutions to long standing problems of the Bay-Delta Estuary. Specifically, the Council will address water quality concerns, effective design and operation of water export systems, maintenance of Delta levees and channels, and guarantees for protection of fish and wildlife resources. The Council has not been given the specific mission of promoting recreation in the Delta. However, some of the BDOC solutions which may be chosen to address problems in the Delta may exacerbate certain recreational impacts or conflict with recreation proposes by local, State and Federal agencies. Therefore, consideration must be given to recreational impacts in order to implement fully effective BDOC solutions.

This briefing paper presents a description of recreation in the Delta today. It also describes the impacts of recreation upon Delta levees, lands, waterways, and wildlife. Finally, it identifies potential actions to accommodate the public's desire for recreational opportunities in the context of protection of the Delta's resources.

In preparing this paper, a comprehensive literature search was completed which included the review of more than 30 government reports and studies assessing recreation in the Delta. These documents, which were prepared from 1961 through 1994 by public agencies of the state, county, and federal governments, provided much of the background data contained herein (see Table 1).

Section I

CURRENT STATUS OF RECREATION IN
THE DELTA AND OTHER MAJOR ISSUES

SECTION I: CURRENT STATUS OF RECREATION IN THE DELTA AND OTHER MAJOR ISSUES

Water has always been a magnet drawing people to recreation areas. It is not surprising, therefore, that the Sacramento-San Joaquin Delta, as one of the largest waterway complexes in the western United States, is a popular regional recreation destination.

Another reason for the Delta's high level of recreational use is its close proximity to several large and expanding urban population centers. In 1990, the population of five counties adjoining the Delta (Contra Costa, Solano, Alameda, Sacramento, and San Joaquin) totaled 4 million people. This population is expected to increase to 5.2 million by the year 2005 (see Table 2).

The combination of open waterways, secluded, narrow, winding sloughs with overhanging riparian vegetation, convenient location and temperate climate all provide the public with a diverse assortment of recreation opportunities. The latest information available on recreation days is an estimated total recreational use in the Delta of 12 million recreation days per year in 1981 by the Department of Water Resources (DWR).

PRESENT RECREATION USES

Recreation in the Delta is primarily water-dependent. It includes such diverse activities as powerboating, fishing, water skiing, sailing, jet skiing, houseboating, swimming, and non-motorized boating (canoes, kayaks, inflatables). Many of the recreation areas in the Delta are only accessible by boat, limiting their use by the general public. Some of the common activities that are not water-dependent include camping, picnicking, bird watching, nature study, hunting and sight-seeing. The location of various recreational facilities in the Delta are identified in Figure 1.

Delta recreation is heavily dependent upon private marinas, which provide access for boaters. There are 82 marinas operating in the Delta, providing 10,902 berths, 46 restaurants, 36 boat launching facilities, 37 boat repair facilities, boat rentals, campgrounds, and picnic areas (Aramburu, pers. Comm.). These marinas are concentrated in a few locations. The largest number are located on Bethel Island.

Public recreation areas and facilities in the Delta are very limited. Presently, there are only 22 public recreation facilities (see Table 3). Brannan Island State Recreation Area, with its excellent boat launching facility and expansive campgrounds, is the largest.

Most public land in the Delta is managed primarily to protect and enhance wildlife resources. To the extent that such management conflicts with recreation, current and potential recreational opportunities may be limited.

Water-Based Recreation Activities

Boating. The Delta is one of the finest recreational boating locales on the west coast, where almost every type of recreational boating activity can be found. Houseboats, sailboats, fishing boats, jet skis, speedboats, canoes, rowboats, and inflatable boats, all commonly use Delta waterways.

About half of all recreation in the Delta involves boating. A 1986 study by the California Department of Boating and Waterways determined that boating represented 56.5% of all Delta recreation. A more recent study, by DWR (Interim North Delta Draft Recreation Use Survey Report, 1993), pegged boating at 45% of all recreation in the Delta.

Most recreational boaters seem to prefer the central and northern portions of the Delta. Boating is a year-round activity, although it does decrease during the winter months.

Not all boating in the Delta is recreational. In 1933, large, ocean-going ships began to move through a Delta deep water channel to the port of Stockton. In 1963, the Sacramento shipping channel was completed. Other commercial traffic includes tugs, barges, dredges, crawfish boats, and commercial fishing boats enroute to the Pacific Ocean, but their numbers are few.

The more popular forms of water-dependent recreation are discussed below.

Houseboating. The Delta is well known for its houseboating opportunities. It is estimated that 5,000 houseboats utilize the Delta (Business Journal-Sacto.). Houseboats typically range in size from 28 to 50 feet, sleeping four to 12 people. Several Delta marinas rent houseboats to the public. (No experience is required to rent a houseboat.) Houseboaters, like other boaters, tend to frequent the central and northern Delta.

Sailing. The Department of Boating and Waterways' Delta Recreational Boating Safety Report (1985) indicated that sailing represents 4.5% of all recreation use in the Delta. Sailors seem to prefer the open waters of the San Joaquin River, and patronize marinas near Sevenmile Slough, Rio Vista, and the City of Stockton. Sailing in the Delta can be challenging because of stiff winds, shifting tides, low bridges, and narrow channels (Spharler, pers. Comm.).

Fishing from boats. Delta waters are home to a variety of game fish: catfish, sturgeon, steelhead, striped bass, largemouth (black) bass, American shad, salmon, crappie, bluegill, and carp. Fishing boats can be launched from Brannan Island State Recreation Area and several other public facilities. However, private marinas and small businesses provide most of the facilities for boat fishing, including launch ramps, bait and tackle shops, and boat rentals.

Anchoring. Some boaters come to the Delta for the primary purpose of anchoring in a quiet slough or other secluded spot for a few hours, a day, a week, or longer. There is no restriction on the length of time someone may anchor in the Delta. Some houseboats are summer homes (Spharler, pers. Comm.). Delta Meadows, located on Snodgrass Slough northeast of Locke, is one of the more popular locations for both long-term and short-term anchoring.

Jet skiing. Jet skiers like the close proximity of the Delta's open water. Private marinas provide their primary points of access. Little is known about the number of jet skiers who use the Delta.

Water skiing. The Delta has long been a popular destination for water skiing. Water skiers, like jet skiers, appreciate the open, flat waters. However, the Delta's lack of suitable beaches is one drawback (Gromm, pers. Comm.). It is unknown how many water skiers use the Delta, but DWR's Delta Recreation Concept Plan (1981) estimated the participation rate to be 15%, making it slightly more popular than photography (11%), and slightly less popular than swimming (23%).

Canoeing and Kayaking. Compared to other types of boating, paddle boating (canoeing and kayaking) is not very common in the Delta. It generally occurs in places and at times where fast powerboats or jet skis are not operating. The popular areas for paddle boats are the Cosumnes and Mokelumne rivers and Snodgrass and Sevenmile Sloughs. The busiest season for paddle boating is fall through spring (Griffith, pers. Comm.).

Other Water-Dependent Recreation Activities

Enjoyment of Delta waterways does not always require a boat. Some of the popular non-boating, water-oriented activities are described below.

Swimming. This activity takes place in many locations, often in the calm, slow-moving waters away from fast-moving boats. There are only a few public swimming beaches, one at Brannan Island State Recreation Area, and one at Sandy Beach in Rio Vista. An informal swimming beach is located at the Cliff House public fishing access located on the Sacramento River north of Rio Vista (McElheney, pers. Comm.).

Bank fishing. Bank fishing occurs along much of the Delta's 1,100 miles of leveed shoreline. Since vehicular access is important to Delta visitors, including anglers, most bank fishing occurs on levees and berms closest to improved roads. Besides informal fishing off the levees, there are several public fishing access points located at Georgiana Slough, the Cliff House, the Borrow Ponds and the City of Antioch's fishing pier.

Windsurfing. Windsurfing is a growing sport that was uncommon in the Delta ten years ago. The area along Highway 160 near Rio Vista is becoming recognized as a world-class windsurfing area. Volunteers have constructed the only dedicated windsurfing facility in the Delta at Brannan Island State Recreation Area.

Land-Based Recreation Activities

Not all recreation activities in the Delta are associated with water. The more popular land-based recreation activities are identified below.

Hunting. Waterfowl and pheasant are the most commonly hunted game. Hunting in the Delta occurs primarily on private agricultural lands during the fall and winter. Access is limited to landowners and members of private hunting clubs who are allowed to hunt for a fee. According to Department of Fish and Game staff, there are 33 hunting clubs in the Delta, comprising about 52,000 acres. Other wildlife species hunted in the Delta includes quail, morning dove, wild turkey, rabbits,

coyotes, and some deer. Some reclamation districts, working with the Department of Fish and Game, allow hunters to use private agricultural property within their districts (Cordes, pers. Comm.).

While most hunting occurs on private property, some hunting is allowed on public lands: Franks Tract State Recreation Area, Lower Sherman Island, Twitchell Island, White Slough Wildlife Area and Manderville Tip.

The actual number of recreationists who hunt in the Delta has not been determined, but estimates indicate hunting represents 3% of all recreation activity in the Delta (Recreation Facilities Plan for North and South Delta, 1988).

Camping and Picnicking. Camping and picnicking are popular elements of Delta recreation. One study estimated that 26% of all Delta recreationists camp overnight, and 24% picnic (Recreation Facilities Plan for North and South Delta, 1988). Many commercial marinas provide campgrounds, most with hookups for recreational vehicles. There are only a few public camping and picnicking facilities (see Table 3). Brannan Island State Recreation Area is the largest, and perhaps the best known.

Hiking and Horseback riding. Horseback riding and hiking in the Delta are uncommon because of the lack of public lands. There is a high demand for horseback riding in neighboring Sacramento County, but the Delta does not have the facilities to meet this demand.

Bicycling. Lightly traveled, scenic roadways adjacent to Delta waterways present a unique bicycling opportunity. However, riding a bicycle on the Delta's narrow and winding roads can be dangerous. Due to a lack of designated lanes and trails in the Delta, bicyclists must share the public roadways with high-speed traffic. For this reason, bicycling does not seem to be encouraged by state and local government, nor by the private sector. DWR's Delta Recreation Concept Plan (1981) indicated that bicycling represents 5% of all recreation activity in the Delta.

Bird Watching and Nature Study. The Delta provides habitat for 225 species of migratory and residential birds, and is therefore a destination for bird watchers and other nature study enthusiasts. The lack of public land and the limited road system significantly restrict public opportunities for studying and observing nature. Stone Lakes, Delta Meadows, and similar large natural areas may be well suited for "birding" and other wildlife study, however, even these passive forms of recreation may be prohibited if the area is a sensitive wildlife habitat.

Driving for Pleasure (sight-seeing). A pleasant drive through the scenic and tranquil Delta region is the primary reason why some 37% of all recreationists visit (Recreation Facilities Plan for North and South Delta, 1988). Use of the several island car ferries can be a unique experience, as well as a visit to the historic towns of Locke or Rio Vista, or other quaint Delta communities.

Special Events. Several communities in and around the Delta sponsor special events to draw large crowds and bolster the local economy. The City of Isleton hosts the annual Crawdad Festival, while nearby Courtland promotes its Pear Fair each summer. Stockton is the location for a number of large boating events throughout the year, and Rio Vista sponsors a bass derby each fall. Walnut Grove hosts the Catfish Jubilee, while Bethel Island hosts a 1950s Bash dedicated to restored automobiles from that era.

ECONOMIC IMPACT OF RECREATION

Recreation and related support services are the third largest contributor after agriculture and natural gas exploration to the Delta economy. Some of the services supported by recreational activity include boat docking, sales and repair facilities, restaurants, grocery stores, equipment rentals, and overnight accommodations (cabins, trailers, motels, and camp sites).

Current information on the economic impact of recreation on communities in and around the Delta is scarce. In 1960, it was estimated that recreation contributed \$75 million annually to the regional economy. In 1982, the Assembly Office of Research estimated the figure to be \$73.6 million. (This amount was based on an estimated 11.9 million annual recreation days, and an estimated expenditure of \$6.18 per recreation day.) USBR's Recreation Facilities Plan for North and South Delta, March 1988, suggested adequate recreation facilities would have boosted the \$73.6 million to a total of almost \$240 million.

The Department of Parks and Recreation conducted a survey of the expenditures of recreationists at Brannan Island SRA in 1994. The preliminary results of this investigation indicate that visitors to this SRA spent an average of \$10.23 per day while recreating in the Delta. The final report should be available in early 1995.

PAST TRENDS IN RECREATION

In general, basic recreation activities in the Delta have changed little over the last 20 years. Based on existing recreation studies, participation rates for boating, fishing, water skiing, houseboating, and camping have remained relatively constant. Jet skiing and windsurfing are the most recent additions to the recreation menu and appear to be growing in popularity.

The market for rental boats for both fishing and skiing has dropped-off significantly, since the early 1970s. According to one source, recreationists now prefer to purchase their own boats instead of renting. The houseboat rental market has also declined in recent years. However, this decline is probably due to current economic uncertainty and a recent change in federal tax policies that make houseboat rentals less profitable (Gromm, pers. Comm.).

According to one Department of Fish and Game warden, two recent changes in Delta recreation have been a decrease in duck hunting and an increase in bank fishing (Doody, pers. Comm.).

FUTURE TRENDS IN RECREATION

Envisioning future recreation trends in California has always been difficult. Recreation planners in the late 1960s predicted that the four-day work week was inevitable, and that an ever-expanding economy would open the flood-gates of demand for additional and more diverse recreational opportunities. Recreation planners in the late 1970s were concerned that gas shortages would keep everyone recreating close to home. Now, in the 1990s, recreation planners are

confronted by the challenge of meeting the growing recreational demands of California's diversifying culture despite shrinking management resources.

Considering the inaccuracy of previous predictions, any assessment of future recreational trends in the Delta should be viewed with some skepticism. Nevertheless, given an appropriate set of assumptions, a look at future recreation trends can be provided. Our assumptions are as follows:

1. The economy of California will remain fairly stable for the foreseeable future.
2. The population of the counties adjoining the Delta will increase approximately 31% from 1990 to 2005 (California Department of Finance, 1994).
3. The need to protect the Delta's fish and wildlife while also preserving the Delta's agricultural businesses will continue to take priority over the desire to provide more recreation opportunities.
4. The need to provide water for agricultural and domestic purposes and for fish and wildlife will continue to take priority over providing more water-oriented recreation opportunities.
5. Tax revenues at the federal, state, and local levels of government will remain scarce.
6. The price and availability of gasoline will remain fairly stable.
7. Boats, recreation vehicles and other expensive recreation investments will enjoy continued popularity, but the sales of these items will fluctuate with the economy.
8. The future availability of public funds to acquire and/or develop lands and facilities in the Delta for active recreation is uncertain.

Given these assumptions, the following recreational trends in the Delta are projected:

1. As the population of counties adjoining the Delta increases, so will recreation demand. Between 1990 and 2005, the population in these counties will increase from 4 million to 5.2 million (31%).
2. Public recreation areas and facilities in the Delta needed to meet the projected demand will not be provided. Therefore, existing and proposed regional water-oriented recreation areas and facilities in northern and central California will have to absorb this additional demand.
3. The lack of public funds will force government agencies to continue to rely on revenue-generating facilities and services at existing and proposed recreation areas. This will bring more public recreation areas and facilities in the Delta into direct competition with commercial marinas and other private suppliers.

4. Opportunities for hunting, bank fishing, wildlife viewing, nature study, and other passive recreational activities will increase, as more land is acquired to protect fish and wildlife.

FUTURE RECREATION OPPORTUNITIES

Public Recreation Opportunities

Existing public recreation areas and facilities in the Delta are insufficient to meet current and future recreation demand. Of the 56 potential recreation sites identified in DWR's 1981 Delta Outdoor Recreation Implementation Plan, very few have been developed. Considering the lack of funds available to public agencies, the prospect of providing adequate additional public recreation opportunities in the immediate future seems remote. There are a few potential projects, however, proposed by the Department of Water Resources, the Department of Parks and Recreation and the US Fish and Wildlife Service which may be feasible in the near term. These are described below.

(DWR) South Delta Program. Proposed enhanced recreational opportunities created by the South Delta Water Management Program would include: 1) channel improvements providing fishing piers, boat ramps, and courtesy docks; 2) channel dredging providing better access for boaters to some scenic stretches of channel; 3) levee setbacks providing fishing access, parking, and view points; and, 4) barrier-type facilities that may improve recreation in shallow channels. This program is still in the planning stage.

(DWR) North Delta Program. Various components of this program would enhance recreational opportunities in the North Delta. Proposed channel improvements could provide the same types of additional recreational development as the South Delta Program above. This program is also still in the planning stage.

Stone Lakes Wildlife Refuge. This proposed 18,000-acre wildlife area will be acquired by the US Fish and Wildlife Service, in cooperation with several state agencies and the County of Sacramento. Proposed recreational development will be limited to facilities for viewing and interpreting wildlife. It is possible that bank fishing could be accommodated, but no facilities will be provided for boating or other active recreation activities.

Sherman Island. The Department of Water Resources is in the process of acquiring this 10,000-acre island so that it will become a protected wildlife habitat. To date, approximately 20% of the acquisition has been completed. It is a good location for providing some recreation opportunities because of its close proximity to Brannan Island SRA and easy access to Contra Costa and San Joaquin Counties via State Highways 12 and 160.

Westgate Landing. The San Joaquin County Department of Parks and Recreation has considered the expansion of this existing facility to provide additional campsites and berths. Due to a lack of funds, however, the county cannot proceed with this project at this time.

Tower Park Public Launch Ramp. This site, located next to the Tower Park Marina, has been identified by the San Joaquin County Department of Parks and Recreation as a potential

location for a new public boat launching facility. The county, however, does not have the funds to pursue this proposed project at this time.

Twitchell Island. DWR has purchased more than 80% of this 3,600-acre island. Most of the land will remain in agriculture until it is converted to wildlife habitat. DWR intends to allow hunting and possibly bank fishing on the island.

Delta Meadows. The Department of Parks and Recreation has purchased 33% of this project. The USBR owns 12% and the remaining 55% of this 600 acres remains in private ownership. Acquisition negotiations are continuing, but will not be completed anytime soon. Although the site is unimproved, except for a primitive boat launch ramp, it is a popular site for anchoring.

Private Recreation Opportunities

Commercial marinas. Marinas with boat launching ramps, campgrounds, and related support facilities provide most of the recreation opportunities in the Delta. There have been no studies of the need for more marina berths. A recent study prepared by the Delta Protection Commission (Recreation and Access Study, 1994) indicated, because of leasing and permitting difficulties, few marina owners expressed a desire to expand their facilities. In recent years, several proposals for new marinas have been submitted to government agencies for consideration, but few have actually been constructed due to funding, permitting, or economic reasons. Right now, a small marina in Walnut Grove is under construction. A new marina has been permitted; the Grand Harbor, located in Sacramento County. Also, a 95-berth expansion of the Willow Berm Marina, also in Sacramento County, is under review (Simmons, Aramburu pers. Comm.).

Delta Wetlands Project. This proposed project would convert two Delta islands into water storage reservoirs and two others into managed wetlands. DFG is currently negotiating with the project proponents, asking that a portion of the project be open for public recreation; including hunting, wildlife viewing, nature study, and photography.

Hunting clubs. Most hunting in the Delta takes place on private agricultural lands. The popularity of these hunting clubs seems to be increasing. However, it is not known if the number of clubs will continue to increase.

CURRENT RECREATION PLANNING EFFORTS

State and local recreation planning in the Delta has been described as haphazard and uncoordinated. Local recreation planning, and all other land-use planning, is typically a county responsibility. Each of the five Delta counties has adopted a General Plan; however, there is little planning coordination among the counties, and each county addresses Delta recreation issues differently.

There is currently no regional recreation plan for the Delta. This situation may soon change, however. The Delta Protection Commission is updating their recreation and access study for the

Delta. As a result of this study, policies adopted by the Commission will become part of a new Delta Regional Plan, which would then be incorporated by the five Delta counties general plans to guide future recreational and public access planning and development.

Besides the five counties, agencies of the state and federal governments exercise significant control over the Delta through various regulatory processes. Serving different mandates and constituencies has led, however, to many of these agencies acting inconsistently with the counties, and each other. In addition, planning efforts are affected by funding and perceived territorial issues. As a result, recreation planning, at the state and federal level, as well as the local, is not successfully coordinated.

LOCAL RECREATION PLANNING

Although each of the Delta counties has adopted a General Plan, including an open space and/or recreation element, each county's approach to planning varies.

Sacramento County: adopted a Delta Community Plan in 1983. It identifies recreational needs and uses in the Delta, identifies which areas are suitable for active recreation, and which should be set aside as natural areas. It endorses clustering commercial recreation development to maintain the open nature of the Delta and prohibits night fishing.

Solano County: adopted a Parks and Recreation Plan in 1983. It cites unplanned and unregulated recreation use as resulting in conflicts among users. It also cites conflicts among governing entities as the leading cause of uncoordinated efforts to implement recreation policies.

Yolo County: planning policies are more general. They encourage development of riverfront recreation, including fishing accesses, public walkways, and waterfront parks.

Contra Costa County: has adopted specific development criteria requiring marina projects be clustered and located near similar uses. Also, commercial projects cannot conflict with adjacent agricultural uses.

San Joaquin County: adopted a 1992 recreation needs study and a General Plan that identifies 10 significant resource areas in the Delta, including Potato Slough, Disappointment Slough, South Spud Island, Middle River and Salmon Slough. Several routes through the Delta are designated as scenic roads by the county. Some limited commercial developments, such as marinas, are permitted in agriculture zones.

In 1985, a joint Delta Advisory Planning Council formed by the five Delta counties adopted a set of land use guidelines for the Delta. The council proposed regulating certain areas to minimize impacts on wildlife habitat, use of speed zones to restrict boating activity in certain areas, and development of a special signage program for recreation land and facilities in the Delta. Although these proposals were not implemented, the DAPC was the predecessor of the Delta Protection Commission.

In addition to the counties, many cities and communities in or near the Delta also have adopted General Plans with open-space and/or recreation elements.

STATE RECREATION PLANNING

As of 1991, public agencies have spent more than \$1 million preparing major reports on Delta recreation planning. The majority of these reports have been prepared by state agencies including the State Lands Commission, the Resources Agency, and the Departments of Fish and Game, Water Resources, and Parks and Recreation. A comprehensive list of relevant State planning documents is provided in Table 1.

CURRENT REGULATIONS

The Delta is regulated by a bewildering maze of local, state, and federal agencies, representing often conflicting and competing interests. There are currently no state or regional provisions to resolve conflicts or inconsistencies between local, state, or regional plans. Consequently, there are no clear, consolidated Delta-wide policies to regulate the placement of recreation facilities or control recreation activities in the Delta.

Issuing of permits by regulatory agencies has been a traditional stumbling block in developing any new facilities in the Delta waterways; streamlining the permit process has been identified as a crucial need (Aramburu, pers. Comm.).

Currently, the following agencies have a role in reviewing or approving the acquisition, development, and/or operation of recreation areas and facilities:

LOCAL AGENCIES

County Government. Delta counties regulate land use through their general and specific plans and zoning ordinances. Recreational developments usually require a use permit and/or building permit from the county.

In addition, law enforcement in the Delta is primarily the responsibility of the affected county sheriff. All five Delta county sheriffs operate boat patrol programs.

Reclamation Districts. These districts are semi-public agencies, comprised of landowners, that maintain levees and drain or irrigate land. About 1,100 miles of Delta levees are maintained by reclamation districts. They levy assessments and sell bonds to pay for the work. Some districts require a permit for projects within their boundaries. Typically, districts attempt to control public access to levees and private lands in the Delta because of damage caused by trespassers.

STATE AGENCIES

Department of Boating and Waterways (DBW)

DBW provides grant funds for boating safety and education, local waterway law enforcement, public access boating facilities, and water hyacinth control. It also licenses yacht and ship brokers. To fund its programs, DBW receives money from boat fuel taxes, boat registration fees, and interest from loans and surplus money investments. It is responsible for adopting state boating regulations and for maintaining uniformity between federal and state boating laws.

Department of Water Resources (DWR)

DWR manages the transport of water and construction of water facilities in the Delta associated with the State Water Project (SWP), which includes the Clifton Court Forebay, the Banks Pumping Facility in the South Delta, the Suisun Marsh Salinity Control Structure and the North-Bay Aqueduct Intake in Barker Slough. DWR is required by the Davis-Dolwig Act to plan for recreation facilities as part of the SWP.

The Reclamation Board

The Reclamation Board issues permits to maintain the integrity and safety of flood control levees and floodways in the Central Valley, including the Sacramento and San Joaquin Rivers and their tributaries. Any activity that encroaches on regulated levees and floodways in the Delta, such as construction of a marina, requires a permit issued by the board.

Department of Fish and Game (DFG)

DFG is the principal agency charged with protection of California's fish and wildlife resources. It regulates hunting and fishing and carries out the State's native plant, fish and wildlife protection laws, as well as the State's Endangered Species Act. In addition, DFG has permit authority over certain recreation activities (such as hunting at Lower Sherman Island and White Slough Wildlife Area). DFG also has permit authority over the development of any recreation improvements, which will divert or obstruct the natural flow or change the bed, channel, or bank of any river, stream, or lake, or proposes to use any material from a streambed such as marinas, fishing accesses, or boat launching facilities.

State Water Resources Control Board/Regional Water Quality Control Boards

These boards regulate surface water diversions and set/enforce water quality standards for the Delta and other waters of the State. Delta recreational activities are occasionally affected by the actions of these agencies. Dredging for a marina, for example, could require a permit from one of the two Regional Water Quality Control Boards (San Francisco Bay Region or Central Valley Region) whose regions include the Delta.

State Lands Commission (SLC)

The SLC may lease or otherwise manage the use of sovereign tidelands, submerged lands and beds of navigable waterways under its jurisdiction. Most Delta waterways are within SLC jurisdiction. Examples of recreational uses that may require the use of sovereign lands are marinas, docks, piers, water skiing facilities, boat houses, boat launching ramps, and floats.

Department of Motor Vehicles (DMV)

The DMV provides boat registration services under contract with the Department of Boating and Waterways.

Department of Parks and Recreation (DPR)

DPR operates three units in the Delta: Brannan Island and Frank's Tract State Recreation Areas and Delta Meadows. Brannan Island provides a camp area, a picnic area, a small interpretive center, and a large boat launching facility. Frank's Tract is accessible only by boat and provides minimal facilities. Delta Meadows is unimproved except for a gravel access road and a primitive boat launch ramp.

FEDERAL AGENCIES

Bureau of Reclamation

The Bureau of Reclamation operates the Central Valley Project which includes the Delta Cross Channel and a pumping plant at Tracy. It does not provide recreation facilities in the Delta.

US Fish and Wildlife Service (FWS)

The FWS administers federal fish and wildlife protection laws, including migratory birds, anadromous fish, and endangered species. While not a permitting agency, the FWS consults with other federal, state, and local agencies on issues of fish and wildlife protection. The FWS generally has the authority to prevent the taking of federally listed threatened and/or endangered species by public or private entities.

US Army Corps of Engineers (USCOE)

A USCOE permit is needed to locate a structure, excavate, or discharge dredged or fill materials into waters and wetlands of the United States, or to place a structure that obstructs or affects navigable waterways. Much of the Delta's land and water falls under USCOE permitting jurisdiction. Construction of a boat ramp or fishing pier, for example, may require a USCOE permit, as would dredging for channel and levee maintenance, placement of rip-rap, and other activities.

US Coast Guard

The Coast Guard patrols the Delta to enforce federal boating regulations. It has the authority to stop boats and to cite operators for reckless driving, intoxication, drug possession, and for non-compliance with federal boat safety standards. The Coast Guard maintains cooperative law enforcement agreements with Delta county sheriffs. It maintains a vessel at Rio Vista for 24-hour search and rescue. It provides and maintains lights, buoys, and other aids to navigation in the Delta, and regulates drawbridges for vessel traffic. It is also responsible for assisting in the prevention and cleanup of pollutant spills in navigable waters.

US Environmental Protection Agency (EPA)

The EPA is responsible for approving water quality standards under the Clean Water Act and air quality standards under the Clean Air Act.

In California, promulgation and enforcement of water quality standards is delegated to the State and Regional Water Quality Control Boards. The counties enforce water quality protection laws as they apply to local water needs.

The Air Resources Boards and the Regional Air Pollution Control/Air Quality Management districts develop regulations and enforce air quality laws. Under a recent court order, however, the EPA has prepared and is circulating a draft Federal Implementation Plan for air quality in an area that includes the portion of the Delta located in Sacramento County. The draft plan proposes that boats sold beginning in 1998 produce 60% lower exhaust emissions. It also proposes that a permit/fee system be established to encourage the purchase of newer, less polluting boats.

Section II

MAJOR RECREATION ISSUES

SECTION II: MAJOR RECREATION ISSUES

IMPACT OF RECREATION ON LEVEES

Levee Inspection Efforts. Reports and studies often cite commercial boat marinas located adjacent to levees as impediments to visual inspection of levees for leaks and other weaknesses. Levee inspectors contacted for the purposes of preparing this briefing paper, however, indicated that marinas are not a problem for them.

Many marina improvements are located on the waterside of the levee, thereby obscuring only that small portion of the levee between the water line and the top of the levee. Also, marinas occupy a very small area when compared to the entire 1,100 miles of leveed shoreline. Anglers parking in front of levee access gates are a problem according to one levee inspector. When these vehicles block access to the levee service road, the inspectors cannot do their job in a timely manner (Burns, Yeoman, Mayers, pers. Comm.).

Flood fighting Efforts. During major floods, boats and other floating debris from marinas may break free and block bridge openings, exacerbating flood danger. Marina structures and facilities are also cited as potential impediments to fighting floods.

Distinguishing between leaks in the levee and leaks caused by broken water and sewer lines can be a problem, especially when the owner of the marina is not sure of the location of these utility lines. However, marina owners are often the first ones to notice and report a levee leak to an inspector (Yeoman, pers. Comm.).

Levee Maintenance Efforts and Costs. It is commonly thought that levees near marinas are more time-consuming and expensive to maintain. This perception may arise from the concentrated use of levees near marinas; accessing marina facilities and boats, and loading and unloading autos and boats (Gromm, pers. Comm.). However, some believe that the need for extra maintenance is usually because marinas receive more public scrutiny, and the owners, therefore, desire a higher standard of levee maintenance (Yeoman, pers. Comm.). Recreationists camping on Delta levees, berms, and revegetation sites has also been cited as a cause of increased maintenance costs.

Erosion Due to Boat Wake. Levee erosion caused by the wake of passing powerboats is one of recreation's biggest impacts on the Delta. Because of this erosion, boats are cited as sources for both declines in wildlife habitat and increases in levee maintenance costs. In 1971, in response to these concerns, the Department of Boating and Waterways (DBW) hired a private consultant to study this problem. In 1975, the Department of Water Resources (DWR) released a similar study, also prepared by a consultant.

The DBW study acknowledged that there are many causes of levee erosion, and it would be very difficult to establish what percentage of erosion results from the various erosive forces at work. Among the causes cited were flood flows, tidal flows, wind-induced waves, ship-induced waves, seepage, rodent burrows, vegetation, wind erosion, traffic, and others.

The study concluded that approximately 20% of the annual energy dissipated against the levees could be attributed to boat-generated waves.

According to the study, the majority of the boats and people are in the Delta when the weather is likely to be good (no high winds and/or heavy rainfall) and the channels will not be in a flood stage. Under such conditions, boats present the most visual source of erosive energy and lead to the perception that boaters are responsible for the majority of levee damage.

DWR's 1975 study analyzed two typical channels in the Delta to determine the relative amount of levee erosion caused by both natural forces and boat-wake. This study stated "In a typical narrow channel, subject to winter floodflows and heavy boat traffic, about 20 percent of the annual energy dissipated against the levees could be attributed to boat-generated waves, about 10 percent to wind-generated waves, and 70 percent to tractive shear stress....In a channel relatively unaffected by winter floodflows, energy dissipation from boat-generated waves was shown to range from about 45 to 80 percent of the total, depending upon wind-movement assumptions made in the computations."

Although the findings of both studies were inconclusive, and both indicated additional study is needed, boats are a visible source of levee erosion. It is that visibility which may account for the apparently disproportionate amount of blame attributed to boat wake when compared to the analysis cited above.

Disturbance to Levees and Berms. Recreationists, especially anglers who drive, walk, or camp on unprotected levees and berms, can disturb the soil and accelerate slope erosion. Also, anglers sometimes damage levees by removing protective rock (rip-rap) for use as campfire rings, to construct small wind shelters, or to roll into the water to create personal fishing platforms. Rip-rap is typically only 18 inches thick, so the removal of only a small section will expose the levee to wave erosion. This is especially a problem with the vast majority of levees that were constructed, without a filter material placed under the rock to help keep soils in place, as they are today (Hardesty, Yeoman, and Mayer, pers. Comm.).

IMPACT OF RECREATION ON DELTA WATERWAYS

Reduced Public Access to Waterways. Development of recreation facilities such as marinas, yacht clubs, and duck clubs can restrict the public's access to Delta waterways. The Department of Fish and Game has received complaints about some duck club employees that attempt to restrict access to public lands and waterways.

Concerns have also been raised about the impact construction of more marinas may have on public access. The use of leveed shoreline for marinas and other commercial recreation facilities can block access to public waterways. Although only a few miles of leveed shoreline are used for marinas, any loss of public access must be considered important, since public lands are such a small fraction of the hundreds of miles of shoreline.

Besides structures on the shore, structures in Delta waterways can also impede public use. In 1981, the US Army Corps of Engineers identified approximately 200 known illegal structures in the water, including private slalom courses, ski jumps, and docks.

Boating Safety. For many years, some Delta user groups have expressed concern over the seemingly high number of boating accidents in the Delta, citing the use of alcohol, operator inexperience or ignorance, and excessive speed as probable causes. Other problem areas mentioned were concentrated boating activity near blind bends, excessive boat wakes, dangerous intersections, narrow channels, and conflicts between various types of boating activities.

In 1984, the Legislature directed DBW to conduct a study of boating safety in the Delta. The resulting investigation concluded that the boating accident rate for the Delta was not significantly higher than that in the rest of the State. The study also indicated that of all boating accidents reported in California, about 10% occur in the Delta. According to DBW staff, the rate for reported boating accidents in the Delta continues to average about 10% of the statewide total (Johnson, pers. Comm.).

As part of the DBW study, Delta law enforcement agencies were surveyed to determine causes of boating accidents. These agencies indicated the following factors were major safety problems: 1) lack of boater knowledge or training; 2) speed and wakes in both posted and unposted areas, as well as a lack of uniformity in regulatory signs; 3) operation of vessels while under the influence of alcohol and/or drugs; 4) obscured visibility due to intersecting waterways or riparian vegetation; and, 5) water skiing and operating "thrill craft" in congested or narrow waterways.

DBW included an analysis of boating accident reports from 1981-85. Of the boaters who reported accidents, 36% were cruising, 18.6% were water skiing, and 13% were simply maneuvering their boat when the accident occurred. It should be noted that this 1985 study was completed before the rapid increase in use of personal watercraft (jet skis) in the Delta. In 1993, personal watercraft accounted for 41% of all boating accidents in California that resulted in injury (Johnson, pers. Comm.).

Houseboating in the Delta appears to be a very safe activity. In 1991, there were only 13 reported houseboating accidents and property damage amounted to less than \$22,000. The main problem with houseboats seems to be their high profile, which creates a "sail area" that can make them hard to manage in high winds and makes docking a real challenge (Business Journal-Sacramento).

As a result of its study, DBW recommended the following actions: 1) state and local agencies should do more to emphasize boating safety education and enforcement; 2) all buoys, waterway markers, information signs, and control zones should be uniform; 3) state and local agencies should do more to inform the boating public of safety problems unique to the Delta, such as merging channels and blind intersections; and, 4) require every person who is convicted of a boating violation to pay a fine or complete a boating safety education course.

Conflicting Water Activities. Recreational use of Delta waterways is essentially unregulated. As a consequence, there are many conflicts between various recreational uses on Delta waterways. For

example, jet skiers, anglers, and swimmers in close proximity cannot help but encroach on each other's activity.

Conflicts are more likely to occur when active uses, such as water skiing and boat cruising, occur in narrow or heavily used channels. Conflicts do occur, however, even when sufficient water surface area is available. The result of these conflicts can range from a spoiled recreation experience to property damage or even serious injury. Another problem can be displacement of passive recreation by active recreation. Typically, active recreation involving fast and/or noisy watercraft will drive away or displace more passive forms of recreation such as fishing or wildlife viewing.

IMPACT OF RECREATION ON PUBLIC AND PRIVATE LANDS

Encroachment on Public Lands. Since 90% of Delta lands and most of the Delta shoreline are privately owned, any loss of public land is significant. Unfortunately, some of the higher non-leveed channel islands are occupied by squatters, and public use is effectively precluded. Although ownership of many of these islands is contested by the state, the land is often occupied by a squatter claiming ownership and preventing public use.

Trespassing on Private Property. With so much of the Delta in private ownership, it is not surprising that trespassing is common. Most boats are launched from private marinas. Once away from the launch area, however, there are few places for boaters to anchor and go ashore without trespassing.

Bank anglers frequently trespass on private property. Except for a few designated fishing areas, most access to the 1,100 miles of shoreline is privately owned.

Recreationists have also trespassed on agricultural lands. Property owners have complained of noise from boats and jet skis, and loss of privacy.

Vandalism. Some reclamation districts are hit hard by vandalism. One such district complained that vandals will shoot up signs, tear down fences (wooden fences are used for firewood), damage outbuildings (shoot out windows and strip off wood for campfires), remove rip-rap from levees and break into water stage recording stations (Hardesty, pers. Comm.).

Fires. The Delta's rich peat soil is flammable. Once a fire is established, the flame is practically invisible, making it very difficult to locate and extinguish. Crops left to dry in the field, such as wheat and hay, can also become highly combustible fuel (Aramburu, pers. Comm.).

It is estimated that unattended campfires cause about 10% of the wildfires in one reclamation district. Many fires originate along public roads, where some are caused by careless motorists, while others are intentionally set (Hardesty, pers. Comm.).

Off-Road Vehicles. Damage to public and private lands by off-road vehicles can be a problem. According to the Department of Fish and Game, these vehicles are used by some hunters and occasionally damage agricultural land (Doody, pers. Comm.). Representatives of reclamation districts, however, did not consider off-road vehicles a serious problem (Hardesty, Mayer, and Yeoman, pers. Comm.).

Increased Maintenance Costs. Property owners responsible for maintaining the Delta's levee system complain about having to pay for erosion damage caused by boat-wake. Damage caused by a trespasser's carelessness or vandalism is an additional expense for the property owner. One reclamation district, complaining of increased maintenance costs, cited the need to fund additional security patrols just to help reduce vandalism (Hardesty, pers. Comm.).

Litter and Trash. Litter and trash are a common problem in the Delta. Because so much recreation occurs illegally on private property, it is difficult to place trash collection facilities where they are needed. The few public recreation facilities are so far apart, and public agencies have such limited maintenance staff and equipment, that trash collection is often inadequate. One local business representative complained: "There's a lot of places where you can just informally go out and fish off the bank...unfortunately, most of those places end up like garbage pits." It should be noted, however, that dumping of household garbage may be responsible for much of the trash found in the Delta.

IMPACT OF RECREATION ON FISH, WILDLIFE AND RIPARIAN HABITAT

The Delta's enduring attraction for recreation purposes is closely linked to protection and management of both fish and wildlife. Riparian habitat plays an important role in this effort. Not only does it sustain the fish and wildlife that are an essential part of the Delta recreation experience, it also provides an aesthetic attraction.

IMPACT ON FISH

Delta fish are affected by a number of factors, including water export operations, Delta agricultural water diversions, changes to the food chain caused by non-native aquatic species, poor water quality, and legal and illegal harvest.

Recreation exacerbates some of these problems. Facilities, boat maintenance, and waste dumping contribute to water pollution and water quality degradation. Recreational fish harvest sometimes includes illegal take and is a factor in fish management decisions.

Water Pollution. Water quality problems are often cited as contributing to declines in fish and wildlife populations. Marinas and recreation boaters are partly to blame. Boats in California are required to have proper sewage disposal equipment; however, few marinas are equipped with sewage pump out facilities, or use proper handling methods. Sewage is often disposed of directly into the Delta. This is illegal but difficult to stop. Some contend that untreated sewage in the Delta waters may be more of a health threat to swimmers than to fish (Doody, pers. Comm.).

Fueling accidents, leaky tanks and lines and carelessness allow spilled oil, diesel, and gasoline into Delta waters. Paint and toxic anti-fouling chemicals contaminate many marinas and spread into the Delta, often in significant concentrations. California has prohibited use of anti-fouling paint since 1988 (Title 3 CCR 6488).

Recreational Fishing. Fishing, both legal and illegal, affects the Delta's biological resources. The reader is referred to the fish harvest briefing paper being prepared by BDOC for detailed information on this subject.

IMPACT ON WILDLIFE

Some Delta recreation activities, such as hunting, bird watching, and nature studies, are directly dependent on the quantity and quality of wildlife.

Unauthorized construction of recreation facilities in waterways and on some channel islands is also a problem. Neither the Corps of Engineers, the State Lands Commission, nor the counties are able to actively inspect and abate these violations. This construction precludes use of some areas by the public and adversely impacts wildlife habitat areas (Aramburu, pers. Comm.).

Human Noise and Activity. There seems to be little information available regarding the impact of human noise and activity on wildlife. Some Delta wildlife is easily disturbed by human activity. In other cases, it appears that Delta wildlife may be fairly adaptable to human activity. One recent study of wetlands in the SF Bay Area stated: "it appears that birds in wetlands with high levels of human activity have become acclimated to this disturbance...however, and most importantly, areas of high human use had substantially lower overall bird use than areas of infrequent human use" (Public Access and Wetlands: Impact of Recreational Use, 1989).

In another study, it was noted that besides reducing levee erosion, "no wake" zones also reduce the impact of boat noise on wildlife (Final Environmental Impact Statement - Stone Lakes National Wildlife Refuge, 1992).

Hunting (legal and illegal) and some recreational activities produce noise and litter that are partly responsible for damage to some wildlife.

Litter. Litter can be injurious or even deadly to wildlife if it is mistaken for food, or if birds or mammals become entangled in it. Litter is a constant problem according to the Department of Fish and Game and offenders are difficult to catch (Doody, pers. Comm.).

Hunting. Hunting in the Delta is carefully regulated to prevent serious threats to overall population survival. Illegal hunting has not been determined to be a serious problem. Almost all hunting of waterfowl occurs on private agricultural lands and property owners do an effective job of preventing unauthorized taking of game birds on their property (Doody, pers. Comm.).

IMPACT ON RIPARIAN HABITAT

Riparian habitat confers on the Delta its characteristic aesthetic quality while also sustaining fish and wildlife. In addition, it often provides shelter to boaters, campers and other recreationists.

The Delta Recreation Master Plan (1976) identified some adverse environmental effects of recreation on Delta habitats: 1) trampling and destruction of vegetation; 2) occasional vandalism; 3) litter accumulations which can injure fish and wildlife; 4) occasional uncontrolled fires (including peat) caused by careless smokers, off road vehicles, campfires and arsonists; 5) localized and increased traffic into natural areas; and, 6) air pollution.

Loss of natural habitat is of serious concern to wildlife biologists. According to the Department of Fish and Game's Delta Wildlife Habitat Protection and Restoration Plan: "Uncontrolled intensive recreational use presents the most serious threat to the habitat values of channel islands, through both disturbance to wildlife activity and modification of habitat conditions by vegetation removal and wave erosion of islands from excessive boat wake."

This DFG report attributes the loss of habitat to the following causes: 1) development of marinas; 2) encroachment of minor structures into waterways and shorelines; 3) conversion of wetland habitat to open water marina basins; 4) damage to marsh and riparian vegetation by boaters' recreational use of islands; and 5) levee-eroding waves from boats, which necessitate replacement of vegetation with rip-rap.

Habitat loss also results from other activities, such as conversion of Delta land to residential development and camping in revegetation areas. The extent of habitat loss exclusively attributable to recreation is unknown.

Boat-Wake. Boat-wake, as previously discussed, is a contributing cause of levee erosion, which can result in loss of wildlife habitat.

Fires. For some recreationists, especially bank anglers, campfires are important to their enjoyment of the Delta. Occasionally, a campfire will get out of control, destroying some of the surrounding riparian habitat. In suppressing this type of fire, slow response time is often the biggest problem. Damage caused by anglers and campers seeking firewood, however, may be a greater long-term threat to riparian habitat than occasional wildfires (Doody, pers. Comm.).

Off-Road Vehicles. Some recreationists using off-road vehicles damage agricultural land, berms, revegetation sites and associated habitat but it is not considered a wide-spread problem (Doody, pers. Comm.).

Section III

INTERRELATIONSHIPS

SECTION III: INTERRELATIONSHIPS

Interrelationship Between Recreation and Agriculture.

Recreation and agriculture compete for the Delta's limited supply of land. The desire to preserve existing agricultural land is well established. However, proposals to provide for additional public access to Delta waterways, and to provide for additional recreational areas and facilities, may make it necessary to acquire agricultural land.

Recreation and agriculture also compete for the Delta's limited supply of fresh water. Pumping water out of the Delta for the benefit of agriculture may be detrimental to fishing, wildlife viewing, and some types of boating. The accessibility of certain sloughs in the eastern Delta for small watercraft such as canoes and kayaks could be reduced by significant decreases of water in the Delta. Conversely, providing additional irrigation water benefits agricultural crops, which may provide feed and cover for wildlife, thereby benefiting both hunting and wildlife viewing.

The relationship between recreation and agriculture can be mutually beneficial. Recreationists who belong to hunting clubs benefit from the use of private agricultural lands, while landowners benefit from hunting fees, which can be used to offset the cost of recreation-induced expenses such as replacing rip-rap.

By developing permanent wildlife habitat within agricultural islands, enhancing seasonal (fall/winter) habitat by leaving crop residue in fields, and by flooding, these tracts of land can provide habitat for many types of wildlife.

Interrelationship Between Recreation and Fish and Wildlife.

The Delta's diverse fish and wildlife resources provide varied recreational opportunities which in turn benefit those resources. Duck and pheasant clubs, which are managed to attract game birds, also provide food and cover for non-game birds and other wildlife. Bird watching and nature study are non-intrusive activities which also increase the public awareness for protection and enhancement of habitat and wildlife values.

Recreational activities can, however, result in uncontrolled fires, littering, and trampling of vegetation; actions that destroy the Delta's natural resources.

Interrelationship Between Recreation and Riparian Habitat.

Riparian habitat is not only essential for wildlife, it also provides natural shade for boaters and campers. Some tall vegetation is essential for shaded riverine aquatic habitat. Recreationists, however, who trample vegetation and cut trees for firewood are a threat to riparian habitat.

Interrelationship Between Recreation and the Local Economy.

The relationship between local residents and recreationists can be mutually beneficial. Goods and services provided by local merchants can be an essential element of a good recreational experience. Income generated from recreationists supports local economies and provides jobs.

The sale and rental of second homes for recreational use also benefits local economics.

Not all recreationists are appreciated however. Some local residents complain that visitors litter the countryside, clog local highways, tax local services, and inflate local prices.

Interrelationship Between Recreation and Private Property Rights.

The relationship between recreationists and property owners is often one marked by resentment and frustration. Since most of the Delta is privately owned, many recreationists trespass to use levees and berms for fishing or to gain access to waterways. Property owners often resent the invasion of privacy and damage caused by the trespassers. They are also frustrated over the inability of the government to resolve the problem. Recreationists are often equally frustrated over the lack of public parking along levee roads, the lack of legal access to waterways, and the lack of public recreation facilities in the Delta. Providing better public access and more public recreation facilities can facilitate the protection of private property from trespass.

Interrelationship Between Recreation and Flood Control.

For many years, recreationists have benefited from the recreation benefits afforded by Delta levees which were constructed and are maintained as flood control elements. However, the vegetative cover that benefits Delta wildlife and is aesthetically pleasing to recreationists, also makes levee inspections more difficult and levee maintenance more costly.

Construction of recreation facilities, such as marinas and boat launch ramps, however, does not seem to have a significant impact on the levees' flood control function. However, the presence of large numbers of recreationists, and the associated recreational facilities increases the potential flood losses, complicates evacuation procedures, and adds to costs of levee maintenance. As discussed earlier, boat wake contributes to levee erosion and may cause them to be more prone to failure.

Interrelationship Between Public and Private Recreation.

The relationship between public and private recreation in the Delta is unique. There are few public waterways in California where there is so much recreation and so few public facilities. Fortunately, existing private marinas provide approximately 36 launch ramps and related boating facilities, supplies and services. In the Delta, the private sector, not the government, is the primary supplier of publicly accessible recreation facilities and services.

Interrelationship Between Recreation and Other Delta Resources.

Since the early 1960s, there have been many proposals for improving public access in the Delta, and for providing adequate recreation areas and facilities. Unfortunately, most proposals to increase recreational activity have a direct or indirect negative impact on biological or agricultural resources and may impact flood protection. Conversely, efforts to improve some other Delta resources could have a negative impact on recreation. For example, proposals to restore shaded riverine aquatic habitat on scarce public lands would reduce the opportunity for development of recreational facilities.

SECTION IV

RESOURCE MANAGEMENT ISSUES

SECTION IV: RESOURCE MANAGEMENT ISSUES

Resource management issues affect the impacts of recreation on levees, waterways, public and private lands and biological resources (fish, wildlife, and riparian habitat). Issues are presented randomly, not in priority order, which could affect the ability of proposed solution actions to successfully address problems within the BDOC mission. For instance, actions proposed to address levee and channel issues may not be fully effective unless the impacts related to recreational activities are considered in those actions. Some of the BDOC solution actions which may be chosen to address Delta resource issues may also exacerbate the recreational impacts described earlier. Additionally, the alternative which is ultimately recommended by the Council may incorporate some recreational features, which may be affected by Resource Management Decisions described below.

Where it was possible to do so, specific recreation oriented actions have been identified that the Council may wish to consider as part of its recommendations in order to accommodate additional recreational opportunities and/or reduce recreational impacts on other Delta resources.

MANAGING RECREATIONAL IMPACTS ON DELTA LEVEES AND CHANNELS

Recreational impacts on Delta levees can be partially reduced or mitigated by taking action to address several issues: providing an equitable funding source for levee maintenance; coordinating area-wide planning efforts; providing more legally accessible and properly maintained recreational facilities; and, reducing boat-wake on waterways.

Providing destination points for recreational boaters is another possible mitigation measure. Research conducted by the Delta Protection Commission has shown that there are few places for boaters to dock (Recreation and Access Study, DPC, 1994). Suggestions have been made that creation of destination points and docking facilities, accessible only by water (though serviced by land), would enhance the land-water interface. Such opportunities would also lessen trespass and other conflicts by boaters assuming the levees are available for public access. Destination points could be picnic areas, areas designated for water skiing and jet skiing, or campgrounds (Aramburu, pers. Comm.).

Issue one: the current level of funding available for levee maintenance is inadequate.

For generations, the public has actively used the Delta for recreation and other purposes without directly contributing to the cost of maintaining its intricate levee system. Additional funding is needed to address impacts attributable to recreational activity occurring in the Delta. These funds could supplement the existing levels of funding for levee maintenance.

- Recreational benefits enjoyed by the general public and the impacts of recreational facilities and activities on the levee system should be evaluated, and quantified and potential cost sharing programs examined.

- Coordination of existing levee assessment and funding programs should be implemented to maximize the utility of very limited funds now available for levee maintenance. Partnerships among existing agencies to coordinate existing levee maintenance assessment and funding programs to improve flood control facilities, and improve environmental restoration in the Delta could address recreational impacts in a more cost effective manner.
- Supplemental maintenance of Delta levees can be provided through alternative sources of labor and funds. The California Conservation Corps, prison work furlough crews and other sources of low-cost labor could be used to assist in routine levee maintenance. Recreation oriented groups and organizations with a vested interest in sustaining their use of the Delta could be solicited to donate labor and/or funds for levee maintenance. In addition, the business community could be encouraged to provide financial support for levee maintenance. From local businesses to large corporations, any organization with a financial interest in sustaining recreation in the Delta could be solicited. All labor and financial donations should be used to supplement, not supplant, existing levels of levee maintenance and would be used to mitigate impacts associated with recreational activities.

Issue Two: land-use plans developed by various public agencies may address recreational issues differently, sometimes resulting in conflicting recreational uses of Delta levees.

- Regional coordination of present and future recreational facilities can assist in controlling recreation-induced impacts on levees. Such an effort would also prevent recreational plans from precluding or impairing the flexibility of implementing proposals to address various levee issues. For example, inappropriate placement of recreation facilities such as marinas could impair future efforts to implement levee improvements recommended by the Council. Any long-term solution to Delta problems should recognize the implications of regional recreational planning on recommended solution alternatives to minimize recreational impacts and maximize their effectiveness.

Issue Three: boat-wake and levee erosion in the Delta.

Boat-wake has been identified as one source of levee erosion that can be mitigated. The significance of boat-wake, however, when compared to other erosive factors, is not known.

- Two completed Delta boat-wake studies were inconclusive: the significance of boat wake on the total levee system, as compared to other factors, was not adequately determined. However, the need for additional research was identified by both studies. A more comprehensive study could help BDOC in its analysis of potential solution actions.
- Implementation and enforcement of restrictions on boat speed can reduce boat wake erosion along the levees. Enforcement of these restrictions may also serve to reduce

vandalism to the levees. Potential benefits and problems created by reduced speed zones could be determined through conjunction with additional research on boat wake.

MANAGING RECREATIONAL IMPACTS ON PUBLIC AND PRIVATE LANDS

Providing better access to public lands and public recreation areas, resolving land title problems, and maintaining an adequate boat patrol program to enforce existing rules and regulations could reduce the impacts of recreation on public and private lands.

Regarding land access, there seems to be a lack of clarity about the responsibility and authority of the various landowners, reclamation districts, counties, and other entities. It is unclear who can require or allow what, or where, and who will and/or has the staffing to enforce anything. The Delta Protection Commission staff supports the concept of tucking improved access into other, larger projects, such as at the Cross Channel (which is now used informally for fishing, but has no support facilities) (Aramburu, pers. Comm.).

Addressing the impacts of recreation on public and private lands is necessary to ensure the effectiveness of proposed actions to address levee and channel issues, and plant and wildlife issues. For example, actions which BDOC may recommend to stabilize and protect levees or to develop additional wildlife habitat could prove to be less than fully effective if recreational impacts are not managed as an integral part of the recommendation.

Issue Four: public lands available for recreation are very limited.

Providing more public recreation areas could be an important part of insuring that the long-term solutions proposed to address the Delta problems are fully effective. Both government and non-profit agencies can acquire more land and build facilities for park and recreation purposes as part of any Delta solution. These agencies should, as part of implementing solution actions, also work with the private sector to encourage the availability of additional private property where appropriate for public recreation purposes.

Some believe consideration should be given to dedicating a small portion of any lands acquired and managed for fish and wildlife habitat to recreation. The Delta Protection Commission's staff does not believe there is a need for acquisition of additional agriculture lands for recreation if lands already in public or quasi-public ownership were better managed to provide recreation/access opportunities (Aramburu, pers. Comm.).

- Recreational benefits enjoyed by the general public should be evaluated and quantified to identify potential cost sharing for areas of fish and wildlife habitat that would be made available for recreation.
- The State Lands Commission has proposed establishing its claim to many non-leveed channel islands, berms and waterways to make the public aware of potential conflict over ownership, and eliminate controversies over claims to public lands by adverse possession. Additional recreation lands could be made available for public use if the

state completed the necessary title work to document and substantiate all of its claims to lands in the Delta. However, it must be recognized that some areas, such as channel islands, often have extremely high habitat values. In many cases, the best use of such lands may be exclusively for wildlife habitat rather than active recreation.

- Certain reclamation districts with private lands have expressed a willingness to allow public use of their levees, provided some other public agency assumes responsibility and liability for maintenance.
- Public sector/private sector partnerships can provide financial assistance to private property owners for development and maintenance of recreational facilities opened to the public. Such partnerships can be sought as a means of ensuring a higher effectiveness for BDOC recommended solution actions. Existing marinas could be encouraged to provide public access to public waterways and, if possible, to provide additional public recreation space. Levee roadside parking, which provides direct access to public waterways, is especially limited. Future marinas can be encouraged to provide direct public access to waterways and provide sufficient space for picnicking and scenic viewing. This action could be accomplished by providing incentives and financial assistance to marina owners willing to provide additional public access to Delta waterways.

Issue Five: better public information on the location of recreation opportunities in the Delta is needed to reduce trespass.

Some of the recreationists who inadvertently trespass on private property do so because they assume that the levees and the land abutting the levees are public property. This misconception is reinforced by the lack of "no-trespassing" signs on private property throughout the Delta. Providing visitors with brochures identifying public recreation areas and warning against trespassing on private property, along with installing adequate highway signs and information kiosks to direct visitors to public recreation facilities can reduce trespass. This can be accomplished as part of normal maintenance, levee repair projects, or environmental restoration and development projects. Better information could also reduce trespass to ecologically sensitive public lands.

However, problems caused by recreationists should be considered before directing visitors to one location over another, concentrating large numbers of persons in one area, or encouraging additional recreation in the Delta. Some of these problems include: vessel operation and safety violations; sanitation/water quality violations; fish and wildlife poaching violations; littering/dumping; inappropriate parking; and, trespass, etc. (Aramburu, pers. Comm.).

Issue Six: area-wide land use planning should be coordinated to maximize use of existing and future recreational opportunities.

The five Delta counties, and numerous affected state and federal agencies, have a strong interest in the Delta, but coordination among agencies has been lacking. Because of

overlapping jurisdictions and the Delta's interrelated environmental problems, there may be benefits to planning and coordinating on a regional basis.

The outer edges of the legal Delta are designated by affected counties and cities as future growth areas. Appropriate development to support recreational use should be included in any plans for further growth. Improvements could include: fishing access areas; fishing piers; bike paths; equestrian trails; nature walks; jogging paths; overlooks; picnic areas; car-top boat launching areas; beaches; swimming access; and others (Aramburu, pers. Comm.). It should be noted that the BDOC Plant and Wildlife Technical Advisory Committee has identified some areas on the edge of the Delta as important and most suitable for preserves and habitat restoration. This potential conflict between BDOC solution options and local and regional plans to accommodate urban growth and its related growth in recreational opportunities will need to be addressed early on in the BDOC planning process.

MANAGING RECREATIONAL IMPACTS ON BIOLOGICAL RESOURCES (FISH, WILDLIFE AND RIPARIAN HABITAT)

Recreational impacts on Delta biological resources can be reduced by coordinating area-wide recreation planning efforts of state, federal and local agencies; by providing additional recreation facilities and, improving access to existing recreation areas throughout the Delta; by establishing and enforcing speed zones on Delta waterways to reduce boat wake; by enforcing public sanitation and pollution regulations; and by providing agricultural landowners incentives to provide public access.

Most of the recreational demand is coming from the areas outside the Delta. Developing recreation and access improvements on the outside edge of the Delta, near major access roads and away from the core Delta lands which are used primarily for agriculture and wildlife habitat purposes could divert their demand away from sensitive lands. As noted above, this effort could conflict with actions to restore biological resources near the edge of the Delta, where some of the most ecologically suitable land is located.

Issue Seven: coordination of area-wide resource planning is necessary to prevent disturbance of sensitive wildlife and habitat areas, and reduce conflicts between incompatible uses of Delta waterways.

Agencies responsible for resource planning often develop plans containing inappropriate or conflicting uses of Delta resources. Coordination of planning efforts is necessary to prevent active recreation and encroachment of recreational facilities in sensitive habitat areas. Coordination may require modification of existing plans prepared by various agencies. Designation of suitable areas for increased public access and development of more recreational facilities can assist in controlling development in sensitive areas. However, increases in recreational opportunities may also increase disturbances of wildlife and increase illegal take of wildlife species. Therefore, controlling active recreation on sensitive habitat areas is also necessary.

As the overall number of vessels in the Delta continues to increase, and as certain areas become more heavily used, it will be important to review the capacity of various waterways for different types of boating activities (Aramburu, pers. Comm.).

Reducing conflicts between competing water recreation activities may be possible by establishing special use zones to prevent incompatible uses such as water skiing and bank fishing.

One or all of these measures may need to be considered as part of any BDOC recommendations on actions intended to restore or enhance biological resources.

Issue Eight: providing improved access to existing public recreation areas can benefit riparian habitat and wildlife by diverting recreationists away from sensitive areas.

Recreational improvements must be made with the support of the local community and must not increase conflicts with agricultural uses. Also, they must be "in the right spot." e.g. fishing access where fish are, not where a parking space can be located (Aramburu, pers. Comm.).

- By providing more recreation areas and facilities, existing and proposed habitat areas can benefit as intensive recreation use is shifted to suitable designated areas. However, stimulating an overall increase in recreational opportunities could interfere with the effectiveness of BDOC recommendations on actions which provide additional habitat restoration by increasing disturbance to existing habitat areas.

Issue Nine: dumping untreated sewage, gasoline, oil, lead-base paints and other contaminants into Delta waters is a threat to land and aquatic habitats.

Marinas and recreational boaters are partially responsible for the reduction of water quality in the Delta. Although dumping untreated sewage, gasoline, oil, lead-base paints, and other contaminants into the Delta is illegal, it continues to be a problem. More can be done to detect such activity and prosecute offenders. Enforcement of public sanitation requirements, dumping regulations, etc. will improve habitat areas. Vigilant enforcement of these restrictions may also benefit habitat by reducing vandalism and litter, and discouraging recreation in sensitive areas.

Currently, a number of law enforcement agencies which includes the sheriff's offices of the five Delta counties, the California Department of Fish and Game, the California Department of Parks and Recreation, the US Coast Guard, and the US Fish and Wildlife Service provide a variety of boat patrol functions in the Delta. Enforcement patrols are typically under-staffed and under-equipped due to budget constraints. Sacramento County's marine patrol budget has decreased from \$750,000 in 1990 to \$160,000 in 1994 (Sacramento Bee). BDOC recommendations on actions intended to address water quality concerns should consider this impact.

Issue Ten: boat-wake, as a contributing factor to levee erosion, has a negative impact on wildlife and riparian habitat.

Additional control over boat speeds in waterways adjacent to unprotected levees could help to minimize erosion and protect sensitive habitat that may be essential for protection of endangered wildlife. Enforcement of these restrictions may also benefit habitat by reducing vandalism, litter and recreation in sensitive areas. These restrictions, however, may discourage some boaters from using the Delta and could have a negative impact on the local economy. Additional research on boat wake, as discussed in Issue Three, would need to be conducted in order to more clearly define the impact of boat-wake on biological resources.

Another concern may be the lack of coordination between the various boat patrol programs. These agencies can communicate with one another by radio, and do so during search and rescue and other infrequent emergency efforts. However, there is little effort to coordinate routine patrols which could increase surveillance of sensitive habitat areas and reduce vandalism to Delta levees.

- In one recent effort to provide more funding for patrols, a bill was introduced in the Legislature that would allow the five Delta counties to increase, from \$5 to \$15, the fee to be paid when boat owners renew their registrations each year. The money would be spent only on increasing marine patrols in the Delta. For affected counties, the fee increase would raise \$1.2 million (San Francisco Chronicle.).

As with many of the issues discussed above, funding is key to implementation. As part of implementation of Delta solution actions, programs could be developed which will provide a level of funding sufficient to protect existing habitats and habitats which would be developed as part of the solution action.

Issue Eleven: use of agricultural land for recreation can reduce impacts to sensitive habitat areas.

The Delta is largely private agricultural lands adjacent to public waterways. Providing better use of existing agricultural lands for public recreation purposes can benefit the Delta's natural resources by diverting recreationists away from sensitive habitat areas. However, proposals to increase the use of private agricultural lands can increase the need for protection of adjoining private property. As agricultural land is used for recreation, the level of impact on all private property and facilities in the immediate vicinity should be evaluated. Without adequate controls, an increase in public use could result in an increase in disturbances to landowners and their families, and increases in opportunities for vandalism. Although a funding source may be necessary to provide compensation to property owners to encourage this dual use, the use of a tax incentive could also be considered as an alternative. These approaches could contribute to better protecting Delta biological resources (specifically sensitive habitats).

Figure 1. Recreational Facilities in the Sacramento-San Joaquin Delta
(Sacramento-San Joaquin Delta Atlas, DWR, 1993)

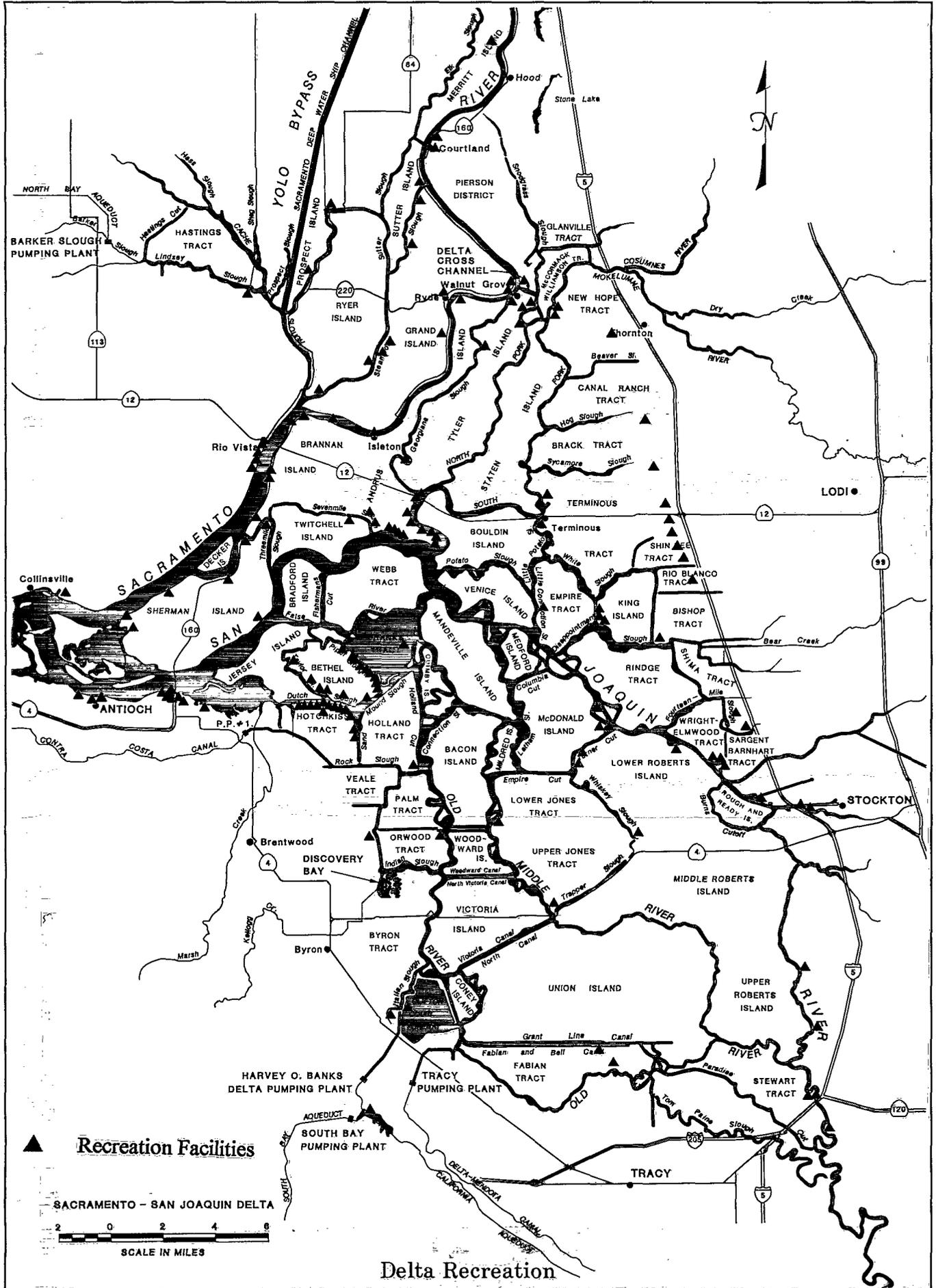


TABLE 1

DELTA RECREATION STUDIES AND DOCUMENTS

Provided below is a list of the recreation and planning studies, prepared by a variety of State, local and federal government agencies, listed in chronological order of publication:

- * Sacramento River and Delta Recreation Study (1961). Department of Water Resources
- * Sacramento-San Joaquin Delta Master Recreation Plan (1966). Resources Agency
- * Sacramento-San Joaquin Delta Master Recreation Plan (1973). Resources Agency
- * Delta Action Plan (1976). Delta Advisory Planning Council
- * Sacramento-San Joaquin Delta Master Recreation Plan (1976). Resources Agency
- * Sacramento-San Joaquin Delta Recreation Survey (1980). Department of Water Resources
- * Sacramento-San Joaquin Delta Wildlife Habitat Protection and Restoration Plan (1980). Department of Fish & Game
- * Sacramento-San Joaquin Delta Recreation Concept Plan (1981). Department of Water Resources
- * Sacramento-San Joaquin Delta Outdoor Recreation Implementation Plan (1981). Department of Water Resources
- * Draft EIS for Sacramento/San Joaquin Delta. 1982. Corps of Engineers
- * Recreation Facilities Plan for North & South Delta. 1988. Department of Water Resources
- * Delta Estuary, California's Inland Coast. 1991. State Lands Commission
- * South Delta Recreation Study (1988). US. Bureau of Reclamation
- * EIR/EIS North Delta Program (1990). Department of Water Resources
- * South Delta Water Management Program (1992). Department of Water Resources

TABLE 1 (Continued)

- * General Recreation Plan for Sacramento-San Joaquin Delta (1992). US. Army Corps of Engineers
- * Interim North Delta Program Draft Recreation Use Survey Report (1993). Department of Water Resources
- * Delta Protection Commission Recreation and Access Study (1994). Delta Protection Commission

In addition, there are a number of other planning efforts prepared for specific geographical areas in the Delta:

- * Resource Management and General Development Plan for Bethany Reservoir. 1973. Department of Parks and Recreation
- * Recreation and Access in the Suisun Marsh (1976). SF. Bay Conservation District
- * Delta Recreation and Park Area (Sacramento County Service Area 4-C) Master Plan 1977-1987 (1977). Sacramento County (Jones & Stokes)
- * A report on Boating in the San Joaquin County (1979). San Joaquin County Planning Department
- * Delta Community Area Plan - Recreation Element (1982). Sacramento County Planning Department
- * General Plan for Brannan Island and Frank's Tract State Recreation Areas (1988). Department of Parks and Recreation
- * EIS for Stone Lakes National Wildlife Refuge (1992). U.S. Fish & Wildlife Service

TABLE 2

POPULATION ESTIMATES AND FORECASTS

(IN THOUSANDS)

COUNTY	1990	1995	2000	2005	CHANGE 1990 - 2005
Contra Costa	810	893	971	1,035	28%
San Joaquin	484	548	624	697	44%
Sacramento	1,051	1,188	1,329	1,454	38%
Alameda	1,282	1,377	1,457	1,514	18%
Solano	346	414	478	523	51%
TOTAL	3,973	4,420	4,859	5,223	31%

Source: Department of Finance, Population Research Unit - 1994

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Table 3
EXISTING RECREATIONAL FACILITIES

Name	Operating Agency	Facilities Provided
Brannan Island State Recreation Area	State Department of Parks and Recreation (DPR)	Land and water access; launch ramp, swimming beach, camp sites, picnic areas, parking, restrooms, interpretive center.
Clifton Court Forebay	Department of Water Resources and Department of Fish and Game	Land access; Parking, only portion of reservoir available for fishing.
Franks Tract and Little Franks Tract	DPR	Water access only; few facilities.
Antioch fishing sites and one fishing pier	City of Antioch	Land and water access; pier, parking, restrooms.
Hogback Park	Sacramento County Parks and Recreation (SCPR)	Land and water access; launch ramps, guest dock, picnic area, parking, restrooms.
Lower Sherman Island	SCPR	Land and water access; launch ramp, parking, restrooms.
Clarksburg Boat Ramp	Yolo County Parks Department	Land and water access; launch ramp, unpaved parking, restrooms.
Oak Grove Regional Park	San Joaquin County Parks Department	Land access; lake, picnic area, dock, natural trails, interpretive center.
Delta Meadows	DPR	Land and water access; few facilities.
Rio Vista Public Launch Ramp	City of Rio Vista	Land and water access; parking, launch ramp.
Rio Vista riverbank	City of Rio Vista	Land and water access; pier, barbecue pits, parking.

**Table 3
Existing Recreation Facilities (Cont.)**

Name	Operating Agency	Facilities Provided
Westgate Landing Park	San Joaquin County Parks Department	Land and water access; camping, restroom, few day uses for picnic.
Buckley Cove Marina Park	City of Stockton	Land and water access; water frontage, fishing, berths, launch lanes, parking, restrooms, gas & repair services, snack bar, playgrounds, organized recreational programs.
Fritz Grupe Park	City of Stockton	Land and water access; water frontage, fishing, picnic area, parking, bicycle racks, playing fields, restrooms, organized recreational programs.
Channel I-5 boat ramp park	City of Stockton	Land and water access; dock, launch lanes, sailing, low speed boating, picnic area, restrooms.
Louis Park	City of Stockton	Land and water access; water frontage, bank fishing, dock, launch lanes, boating, parking, bicycle racks, picnic areas, playing fields, restrooms, snack bar, organized recreational activities.
Dos Reis County Park	San Joaquin County Parks Department	Land and water access; water frontage, launch ramp, water activities, RV camp sites.
Mossdale Crossing Park	San Joaquin County Parks Department	Land and water access; launch ramp, parking, restrooms.
Georgiana Slough Fishing Access	SCPR	Land and water access; parking, launch ramp restrooms.
Cliff House Fishing Access	SCPR	Land and water access; parking, restrooms.

Source: State Lands Commission, 1991.

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Cordes, Steve. Wildlife Biologist, DFG, Stockton, CA. August 18, 1994 - telephone conversation.

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Gromm, Bob. Member, Citizen Advisory Committee, Delta Protection Commission, Bethel Island, CA. July 13, 1994 - telephone conversation

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Johnson, Dave. Manager, Boating Operations Section, California Department of Boating and Waterways, Sacramento, CA. June 6, 1994 - telephone conversation.

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Roberts, Steve. Senior Engineer, No. Delta Management Section, Department of Water Resources, Sacramento, CA. June 22, 1994 - telephone conversation.

Simmons, Duncan. Staff Council, State Lands Commission, Sacramento, CA. June 30, 1994 - telephone conversation.

PERSONAL COMMUNICATIONS (Continued)

Spharler, Lon. Manager, Planning Section, California Department of Parks and Recreation, Sacramento, CA. June 27, 1994 - meeting.

Thomas, Larry. Supervisor, California Department of Boating and Waterways, Sacramento, CA. June 7, 1994 - telephone conversation.

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