



CALFED
BAY-DELTA
PROGRAM

Final Programmatic Environmental Impact Statement/Environmental Impact Report

July 2000

For purposes of this description, the Bay Region includes San Francisco Bay, San Pablo Bay, Suisun Marsh and Bay, and the coastal regions in California and Oregon that support ocean sport and commercial salmon fishing.

Large undeveloped areas of land are found in the western, northern, and southern parts of the Bay Region. Lakes and reservoirs are popular day-use destination sites for local residents. These lakes and reservoirs and the surrounding parks accommodate recreation activities year-round because of their proximity to major metropolitan areas. Water resources operated by the San Francisco Water District do not substantially contribute to recreation use in the Bay Region because of access restrictions.

As elsewhere in California, the quality of recreation at lakes and reservoirs in the Bay Region depends largely on surface water levels. During severe drawdown conditions, access to boat ramps and swimming areas is substantially reduced or eliminated. Water-enhanced activities, such as picnicking and hiking, also can be affected as water levels fall.

The Suisun Bay and Suisun Marsh historically have been popular areas for waterfowl hunters. Past estimates of total annual waterfowl hunter-days in the marsh, including use of public hunting areas, range from approximately 48,000 to 62,000 days per hunting season.

In addition, the state owns 15,000 acres in Suisun Marsh at the western edge of the Delta, including approximately 6,000 acres of public hunting areas that compose the Grizzly Island WMA. According to DFG staff, a total of 33 private hunting clubs in the Delta comprise about 52,000 acres.

The San Francisco Bay Estuary supports important sport fisheries for sturgeon, salmon, and striped bass in California. In 1954, following a 35-year moratorium on commercial and sport fishing for sturgeon, a sport fishery in the Bay Region was reestablished. Most of this fishery was centered in San Pablo Bay. Between 1954 and the mid-1960s, most sturgeon were taken incidentally by striped bass anglers. Although exact sport-catch data for white sturgeon are not available, the catch rate for sturgeon is estimated to have increased by 40% over the last two decades. This increase suggests that fishing for sturgeon has become more popular as stocks of other game fish, such as striped bass, have declined. In response to increased angler success, catch regulations were modified.

The salmon sport fishery in California did not become important until after World War II, long after the commercial salmon fishery was established. Historically, the sport fishery has harvested approximately 14% of the salmon landed within the California coastal region, with commercial fishing accounting for 86%. Salmon landings data between 1940 and 1985 show that salmon fishing activity reached major peaks in 1955, 1968, and 1972. These data also indicate that fishing activity reached lows in 1957, 1960, and 1978.

Historically, chinook has been the most important salmon species caught in the California coastal fishery, accounting for 79% of the total salmon sport catch. Most of the ocean salmon sport catch has occurred in the San Francisco area, accounting for 67% of total sport landings between 1979 and 1985.

Commercial sport fishing vessels have played an important role in the history of the ocean sport fishery, accounting for an estimated 65% of the total sport harvest of salmon in the California coastal region. Most of these vessels have originated from the San Francisco Bay Area.

Currently, the quality of sport fishing activities in the Bay Region is associated with abundance, migration patterns, and fishing regulations. Sport fishing in the region occurs year-round from private vessels, from charter boat vessels, and along the shore. The popularity of shore and boat fishing is associated with the



type of sport fish being sought. Most fishing occurs aboard private vessels. Charter boat operators indicate a sustained decline in the popularity of fishing aboard these vessels.

White sturgeon is one of the popular game fish sought in the Bay Region. Sturgeon are popular game fish because of their large size; however, they have one of the lowest catch rates per hour of angler effort for sport fish in the region. Fishing trips for sturgeon are taken aboard private and charter boat vessels. Sturgeon fishing continues year-round in San Pablo Bay. Fishing success probably is associated with the movement of the fish in response to changing salinity conditions in the Bay-Delta, which is influenced by river flows into the Delta. Sturgeon are more likely found in San Pablo Bay during wet years and further upstream in the Suisun Bay area in dry years.

Ocean sport fishing for salmon in the California coastal areas accounted for an estimated 127,000 visitor days in 1992. This level of use generated an estimated \$10.4 million in trip-related expenditures. Nearly 50% of the expenditures generated by sport fishing occurred in the San Francisco region.

Although salmon support a large sport fishery in the ocean, the current salmon sport fishery in the Bay is relatively small. Salmon typically are caught in the area around the Golden Gate Bridge and upstream of the Carquinez Strait.

Currently, striped bass is the most important sport fish caught in San Francisco Bay. Fishing for striped bass occurs aboard private and charter boat vessels or from shore. Most of the catch of striped bass in California occurs in the Bay-Delta Region. The quality of striped bass angling in the Bay-Delta region depends on location, abundance, and regulations. During winter, striped bass are relatively inactive and fishing success is relatively low. Fishing increases in spring as the fish begin to move up through the Bay and the Delta to spawn. Delta conditions are believed to affect the early life stages of striped bass. Although not directly affecting fishing success, size and possession limits can restrict total angling efforts for striped bass.

Overall, sport fishing in the Bay Region has been declining. Consequently, recreation-related spending associated with sport fishing also has decreased in its contribution to the local and regional economy. Economic declines associated with affected sport fisheries also are indicated by historical reductions in the number of charter boats operating in the Bay Region.

The ocean commercial salmon fishery in California began operating in the 1880s in Monterey Bay. Historically, on average, approximately half of all commercial fishing vessels in California land salmon. Since a limited-entry program was established for salmon in 1982, about 77% of all California vessels have been in possession of a salmon permit, and 63% of all permit holders have actually landed salmon. Between 1916 and 1943, ocean landings of chinook salmon in California ranged from 2.2 to 7.2 million pounds and averaged 4.5 million pounds per year. Landings experienced a general upward shift during 1944 to 1982, from 3.7 to 10.3 million pounds, respectively. Important factors contributing to this upward shift were the termination of gill-netting in inland waters in 1957 and the development of fish hatcheries in the American and Feather Rivers in the 1960s.

Salmon originating from the Sacramento and San Joaquin River systems also are caught in Oregon coastal fisheries. Approximately 10–20% of the fish caught in the commercial chinook salmon fishery in Oregon are from the Central Valley. Between 1952 and 1993, commercial landings of chinook salmon in Oregon, where the fishery is much smaller than in California, ranged from 53,000 to 530,000 pounds. California coastal landings over the same period ranged from 1.6 to 14.8 million pounds. Landings in Oregon have



been subject to wide fluctuations, similar to the variability of California landings. Oregon commercial salmon landings averaged 212,500 pounds from 1967 to 1993.

A change that has occurred over the years has been the disappearance of spring-run chinook salmon from the ocean harvest. Most of the fish caught today in the commercial harvest are fall-run chinook salmon. Another change has been an increasing proportion of hatchery fish in the catch, with recent estimates ranging from 30-40% overall, and as high as 86% on rivers with terminal hatcheries. Although this change has served the hatcheries' initial purpose (to offset the loss to the populations of fish that would have spawned above major impoundments), it may contribute to the instability recently seen in ocean catch, with a boom-and-bust pattern of harvest dependent on survival of broods from a few major facilities.

Commercial landings of striped bass ceased after 1935 when the commercial fishery for this species was closed, and American shad landings ceased after 1957 when the Sacramento and San Joaquin Rivers were closed to all commercial fishing. Historically, salmon has dominated the commercial harvest of anadromous species, even in years when other anadromous species were landed in significant numbers.

Of all the anadromous fish species addressed in this report, only chinook salmon continues to support a commercial fishery. Commercial fishing for striped bass, sturgeon, and steelhead trout ended before development of the CVP. The commercial fishery for American shad officially ended in 1957, when most commercial fishing in the Bay and Delta was banned by the state legislature.

Key economic indicators of the commercial salmon fishing industry are the relative poundage and ex-vessel value of salmon landed at different ports in proportion to the total pounds and value for all commercial seafood landed at these ports. In 1992, salmon accounted for 0.03% of the total pounds of seafood landed and 0.13% of the total ex-vessel value of seafood landed at ports in the North Coast region, 2.0% of total pounds of seafood landed and 8.0% of the ex-vessel value of all seafood landed at ports in the San Francisco area, and 0.83% of the total pounds of seafood landed and 4.2% of the ex-vessel value of all seafood landed at ports in the Central Coast area.

Another important indicator of the economic health of the commercial salmon fishing industry is the number of permit holders. In 1993, the number of salmon fishing permit holders in California was 2,740, a 54% reduction from the 5,964 permit holders at the inception of the limited entry program in 1982. The percentage of salmon permit holders who actually fished for salmon also has declined over time, and the size of the fleet has declined to record low levels. The decline has been particularly acute for vessels that obtain a relatively significant amount of income (more than \$5,000 annually) from salmon fishing; these vessels account for 85% of the total revenue generated from the fishery. A gradual aging of the fleet has occurred since the early 1980s, perhaps due to declining fishing opportunities. The state's limited entry program also has contributed to this aging by restricting the entry of new vessels into the fishery.

The relative amount of personal income generated by the salmon industry also indicates the economic importance of the industry to a region. In 1992, the salmon industry in the North Coast region, including harvesting and processing activities, generated \$100,000 in personal income, which accounted for less than 0.01% of the total personal income generated within the region. In the San Francisco area, the salmon industry generated \$5.9 million in 1992, which accounted for 66% of all income generated by the salmon industry in the California coastal areas but only about 0.01% of the total personal income generated within the region. In the Central Coast area, the salmon industry generated \$2.9 million in 1992, accounting for approximately 33% of all income generated by the salmon industry in California coastal areas but only about 0.01% of the total personal income generated in the region.



It should be noted, however, that 1992 was a poor year for salmon harvest at many California ports, particularly in the North Coast region. More representative data from 1986 to 1990 show that personal income from salmon harvesting in the North Coast region averaged \$16.2 million annually, representing 0.5% of total income in the region.

Fishing-dependent coastal communities, as a whole, have varied in their ability to adjust to declines in commercial and sport fishing activity. Communities in the southern and inland portions of the California coastal region adjusted to the decline by turning to other industries for economic growth. The transition to other industries has been more difficult for communities in the northern portion of the California coastal region.

7.7.3.3 SACRAMENTO RIVER REGION

Major recreation areas in the Sacramento River Region include lakes and reservoirs, rivers and streams, and federal wildlife refuges and state WMAs. Private lands also support considerable waterfowl hunting activity in the region.

Overall, recreation use at important reservoirs, rivers, and wildlife refuges in the Sacramento River Region has paralleled increased population growth in the region. Consequently, recreation-related spending associated with increased visitation has become an important contributor to the local and regional economy.

Recreation opportunities in the Sacramento River Region have been shaped by the construction of large reservoirs and the alteration of major rivers. Construction of Shasta Lake, Whiskeytown Lake, Lake Oroville, Folsom Lake, New Bullards Bar Reservoir, and Englebright Lake provided extensive reservoir recreation opportunities, including flat-water recreation.

Shasta Lake was the CVP's first major multipurpose facility, constructed in 1945. Initial recreation use did not occur until 1948, when the reservoir was filled. The U.S. Forest Service (USFS) began developing and managing recreation resources at Shasta Lake after the Whiskeytown-Shasta-Trinity National Recreation Area (NRA) was established. Historically, Shasta Lake has been the most popular recreation reservoir. Whiskeytown Lake, constructed in 1963, also is located in the NRA, with recreation facilities managed by National Park Service. Between 1970 and 1985, annual recreation use at Whiskeytown Lake ranged from a low of 804,000 visitor days in 1974 to a high of 1.6 million visitor days in 1976 and then declined through the early 1980s.

Folsom Lake, completed in 1955, was the second major lake or reservoir constructed by Reclamation in the region. DPR manages the lake's recreation facilities. Visitation is not well documented between 1955 and 1970. After 1970, visitation declined from approximately 2 to less than 1 million visitor days in 1977 but increased to nearly 2.8 million visitor days in 1985. Lake Oroville, a part of the SWP, was completed in 1968, with recreation facilities operated by DPR. Since 1968, visitor use has fluctuated substantially, ranging from 288,000 visitor days in 1968 to 939,000 visitor days in 1981. Visitation declined substantially in 1985 to 771,000 visitor days.

Other major lakes or reservoirs in the region include Englebright Lake and New Bullards Bar Reservoir. Visitation at both has increased steadily from 1941 to 1985. Because Englebright Lake was constructed to control mining debris, recreation use did not begin until new techniques for controlling debris were developed in the early 1960s. From 1970 to 1985, annual visitation at Englebright Lake increased from



66,000 to nearly 116,000 visitor days. Recreation use at New Bullards Bar Reservoir increased steadily from 1970 to 1985, although historical records appear to understate the total amount of recreation known to have occurred at this facility.

Major rivers that could be affected by Program actions include the Sacramento, American, and Feather Rivers. Tributaries to the Sacramento River that could be affected by stream restoration measures include Cottonwood, Cow, Deer, Bear, Battle, Mill, Paynes, Antelope, Butte, Big Chico, Thomes, and Elder Creeks and the Colusa Basin Drain.

Recreation activities along rivers in the Sacramento River Region were modified with the construction of dams on the Sacramento, American, and Feather Rivers. Before major dams were constructed, flows and water temperatures fluctuated seasonally. Low flows and relatively high water temperatures occurred in summer, and high flows and low water temperatures occurred in winter. In some instances, modification to river flows resulted in substantial changes to sport fisheries.

Before Shasta Lake was built, summer flows in the Sacramento River were low, water temperatures rose above optimum ranges for salmon, and only warm water species were present below the dam site during summer. The most common summer game fish in the river before construction of the lake were striped bass and catfish. After Shasta Lake was constructed, water temperatures and flows in the river were altered to such a degree that a year-round salmonid sport fishery was created. Chinook salmon, steelhead trout, and rainbow trout made the greatest contribution to the fishery.

The popularity of the Sacramento River is indicated by the growth in the number of recreation-related facilities. On the reach of the river between Orland and Redding, the number of boat landings to serve the growing sport fishery increased from zero in 1945 to 11 in 1949. An estimated 46 establishments (such as resorts and bait shops) serving the sport fishery were in operation along the river in 1949. Between May 1948 and February 1949, an estimated 8,000 salmon and 3,800 rainbow trout and steelhead were caught on the reach of the river between Orland and Redding. Between 1968 and 1975, an estimated annual average of 17,500 salmon were landed in the entire river.

The Feather River below Lake Oroville and the Yuba River below Englebright Lake continued to support an important anadromous fishery, although not as extensive as that on the Sacramento River. Changes in water flow and temperature in the Feather River after completion of Lake Oroville did not substantially alter the number of fish species present in the lower portion of the river. Averages based on angler surveys conducted from 1968 to 1974 indicate that 530 striped bass, 1,800 steelhead trout, and 644 chinook salmon were caught annually.

Wildlife refuges in the Sacramento River Region provide fishing, hunting, and wildlife viewing opportunities. These refuges include Sacramento, Colusa, Sutter, and Delevan NWRs and Gray Lodge WMA.

Gray Lodge WMA, the first wildlife refuge in the Sacramento River Region, was established in 1931. Historically, Gray Lodge WMA has been the most popular of the five refuges in the region, accounting for approximately 61% of total use at all refuges in the region between 1973 and 1985. Use at the refuge increased by approximately 95% between 1973 and 1985. The Sacramento NWR, established in 1937, historically has been the second most popular refuge in the Sacramento River Region. Non-consumptive uses accounted for approximately 73% of total use during 1973 and 1985. Colusa NWR, established in 1944, has been the third most popular refuge in the region, with an annual average of 8,000 visitor days between 1973 and 1985. Non-consumptive and consumptive uses historically have been equally popular



at the refuge, each accounting for 50% of total use. Sutter and Delevan NWRs, established in 1944 and 1963, respectively, have been used almost exclusively for hunting. Between 1973 and 1985, annual hunting activity averaged approximately 2,500 visitor days at Sutter NWR and 5,500 visitor days at Delevan NWR.

Water-dependent activities at these potentially affected reservoirs, rivers, and wildlife refuges in the Sacramento River Region generated approximately 5 million visitor days in 1992. This level of activity generated an estimated \$100 million in recreation-related spending. Because 1992 was a dry water year, this level of activity likely understates what occurs in most years.

7.7.3.4 SAN JOAQUIN RIVER REGION

Reservoirs, rivers, and wildlife refuges in the San Joaquin River Region support a variety of recreational activities, including sport fishing, hunting, boating, camping, swimming, picnicking, and sightseeing. Private lands also support considerable waterfowl hunting activity in the region.

Important reservoirs and lakes in the San Joaquin River Region include San Luis, Millerton, New Melones, New Don Pedro, McClure, and New Hogan. Except for New Melones Reservoir, these reservoirs were constructed in the 1960s and 1970s. Important historical use trends at these reservoirs include substantial increases in use during the 1970s and 1980s, particularly at San Luis Reservoir, Lake McClure, and New Hogan Lake.

Important rivers in the San Joaquin River Region include the San Joaquin, Stanislaus, Tuolumne, and Merced. Millerton Lake modified the flows and temperature of the San Joaquin River. During the irrigation season, the river was diverted substantially, creating hazards for chinook salmon, steelhead trout, striped bass, American shad, and sturgeon.

The Stanislaus River downstream of Goodwin Dam historically supported resident populations of warm water game species, including largemouth and smallmouth bass, channel and white catfish, black crappie, bluegill, and green sunfish. Historical anadromous fish populations below Goodwin Dam included chinook salmon, steelhead trout, striped bass, American shad, and sturgeon. Salmon production in the Stanislaus River contributed to sport and commercial catches in the ocean and lower San Francisco Bay.

The Tuolumne River historically supported a significant trout fishery in the upper cold water reaches of the river. Rainbow, brown, brook, and golden trout ranged as far downstream as the present location of New Don Pedro Reservoir. Largemouth and smallmouth bass, bluegill, white catfish, and other warm water fish species were common in the lower foothill and valley reaches of the river. Before impoundment of the lower reach, the Tuolumne River supported steelhead and annual chinook salmon runs of up to 100,000 fish.

The Merced River historically supported significant populations of spring- and fall-run chinook salmon. The salmon run on the Merced River declined and was in poor condition for at least 20 years before the construction of Lake McClure. Operation of the dam has improved the project flow conditions, and salmon habitat improvement projects have effectively maintained chinook salmon populations.

Overall, recreation use data for these rivers are limited. In 1962, DFG estimated that the Stanislaus River chinook salmon run supported an average annual use of 10,000 angler days of sport fishing. No other use data for the Stanislaus River or other important rivers in the San Joaquin River Region are available.



Wildlife refuges in the San Joaquin River Region provide fishing, hunting and wildlife viewing opportunities. Important wildlife refuges in the San Joaquin River Region include Los Banos and Volta WMAs; and Kern, Kesterson, Merced, Mendota, Pixley, and San Luis NWRs. Historical use data for NWRs are not available; however, overall use trends at the NWRs probably resemble the trends at the WMAs. Recreation use at Los Banos WMA and Volta WMA increased from an estimated 36,400 visitor days in 1973 to an estimated 69,300 visitor days in 1985. Recreation opportunities for both non-consumptive and consumptive activities are provided at all wildlife refuges in the region.

Overall, recreation use at important reservoirs, rivers, and wildlife refuges in the San Joaquin River Region has been increasing since the 1940s. Consequently, recreation-related spending associated with increased use by visitors to the recreation areas has been increasing and has become an important contributor to local and regional economies.

Other potentially affected lakes and reservoirs in the region include Bethany Reservoir, O'Neill Forebay, New Hogan Lake, Camanche Reservoir, and other reservoirs located upstream of major reservoirs. Fishing opportunities also occur along the California Aqueduct and the Delta-Mendota Canal.

Overall, water-dependent activities at potentially affected reservoirs, rivers, and wildlife refuges in the San Joaquin River Region generated approximately 3 million visitor days in 1992. This level of activity generated an estimated \$60 million in recreation-related spending. Because 1992 was a dry water year, this level of activity likely understates what occurs in most years.

7.7.3.5 OTHER SWP AND CVP SERVICE AREAS

The Other SWP and CVP Service Areas region includes two distinct, noncontiguous areas: in the north, are the San Felipe Division's CVP service area and the South Bay SWP service area; to the south, are the SWP service areas. The northern section of this region encompasses parts of the central coast counties of Santa Clara, San Benito, Santa Cruz, and Monterey. The southern portion includes parts of Imperial, Los Angeles, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, and Ventura Counties.

Development of the SWP and CVP created recreational opportunities at facilities constructed outside the Central Valley. Use of these facilities has generated spending in local economies and benefitted recreationists. Most of the recreational use of SWP and CVP facilities occurs at storage reservoirs.

In southern California, recreational opportunities are provided at Castaic, Pyramid, Silverwood, and Perris Lakes. Recreation-related spending and benefits to users of these facilities generally have grown in proportion to population growth. In 1992, recreation use of these facilities was estimated at 3.1 million visitor days, generating about \$130 million in trip-related spending.

7.7.4 ASSESSMENT METHODS

Both qualitative and quantitative methods were used to assess changes in recreation opportunities, use of affected facilities, and related economic effects. Quantitative methods included consideration of thresholds at which recreation opportunities are affected (for example, the reservoir level at which boat ramps become unusable and use declines). More qualitative methods used to assess recreation impacts included



consideration of potential effects on the availability and accessibility of recreation sites; support facilities at affected recreation sites (for example, boat launches and docks); and the abundance of fish and wildlife, particularly waterfowl and other bird species.

The effects of the alternatives on each of these recreation opportunity indicators were evaluated at representative locations in each region. Information on potential changes in hydrologic conditions and results of the biological assessment were used to conduct the analysis. The overall impact on recreation resources in the regions also was considered.

Important economic indicators that were considered include changes in spending by visitors to affected recreation areas. Although the economic indicators were not quantified (except for the No Action Alternative), the magnitude of potential changes is described. (For the No Action Alternative, spending values were estimated by adjusting the values for existing conditions by the percentage change in population between 1995 and 2020.) The effect on recreation use of allocating potential costs of the Program to recreation users was not explicitly considered because these costs are unknown at this time.

Potential impacts on commercial fishing in the Delta and Bay Regions were evaluated qualitatively.

7.7.5 SIGNIFICANCE CRITERIA

Program actions would result in a potentially significant adverse impact on recreation resources if recreation opportunities at affected facilities were substantially reduced, which also could lead to substantial effects on recreation-serving businesses. Although professional judgment must be relied on in evaluating the significance of these impacts, a conservative approach was used. Any measurable reduction in recreation opportunities or use was considered potentially significant unless otherwise noted.

Conversely, if Program actions could enhance recreational opportunities at affected resources or increase use, the impact was considered beneficial.

Among the types of Program-induced effects that could result in potentially significant impacts on recreational opportunities are:

- Fluctuation in lake or reservoir water levels.
- Changes in fresh water flows in rivers and the Delta during the recreational season.
- Changes of river temperature that reduce recreational swimming, tubing, canoeing, kayaking, and rafting.
- Temporary restriction of recreation activities due to construction.
- Conversion of recreation facilities to other uses.
- Changes in aesthetic conditions that could affect visitor appreciation of an area.
- Reduction of opportunities for one activity resulting in an increase in visitor days for other recreational uses in the Delta (shifting activities).

