

ECONOMICS OF THE FISH AND WILDLIFE RESOURCES OF THE SAN FRANCISCO BAY AREA

In this section of the report an attempt is made to summarize the available information on the economics of the fish and wildlife resources of the Bay Area. Collectively, the resources, by whatever means of analysis, generate an economy of tremendous magnitude.

Unfortunately, a standard method has not yet been developed for expressing the value of sport fish and wildlife resources. Various agencies may use different methods to estimate the value of the same resource.

Unlike most things subjected to economic analysis, fish and wildlife, or water in a flowing stream or in a lake, have an aesthetic value over and above the actual wealth which they generate. A uniformly acceptable means of integrating this intangible element into an economic formula has not yet been devised.

There are several common methods of analysis. Those most often employed are based either on gross expenditures or on the primary or net value of the resource.

The gross expenditure by an angler or a hunter for example, usually far exceeds the actual market value of the game which he seeks. For example, economic surveys have shown that it costs the average angler more than \$16 to catch a single salmon or steelhead. Obviously, this cost exceeds the food or commercial value of the fish by a considerable margin.

Proponents of the gross expenditure method maintain that the expenditure incurred by the participant, over and above the commercial value of the game, reflects the aesthetic and recreational value of the resource to the participant.

The other extreme, of course, is to consider only that value which the resource would command on the market at the primary level. This is usually complicated by the fact that few game species are sold commercially. This method obviously neglects the recreational and aesthetic qualities entirely.

Where strictly commercial fisheries are involved, the problem usually does not exist. The value received by the fisherman (primary value) less the overhead is usually used.

But in the case of salmon, which is both a commercial and sport fish, the proportion of the resource subject to exploitation by each is usually considered separately.

In the following discussion the gross expenditure method is employed in assessing the economy of the non-commercial wildlife resources. Commercial fisheries are generally evaluated at the primary or ex-vessel value. Estimates are also given of the capital

investments in the resources insofar as they could be determined.

The numbers of angling, hunting and trapping licenses and sales of commercial fishing licenses since the inception of each are given in Appendices I-1, I-2, I-3 and I-4, respectively. It is interesting to note that the number of anglers and hunters is increasing at a more rapid rate than the general population.

FISHERIES

Commercial Fisheries

The fisheries products marketed at San Francisco since 1941 have yielded from less than three to more than five million dollars annually to the fishermen. During the five-year period 1951-1955, the ex-vessel value has average \$3,457,206. The retail value of most fresh fish products is about three times the ex-vessel value, and for canned or specially prepared products five to ten times the price paid to the fishermen. The total value of these products therefore, at the consumer level, could conceivably range from a minimum of \$13,500,000 to more than \$18,300,000 annually, as shown in Table 58.

In the anadromous fisheries section of this report, it was reported that 70 percent of the California salmon landings are from stocks which depend on passing safely through the Bay Area. On the basis of the 1952-56 catches, \$2,000,000 annually was attributed to these commercial salmon. **Only one-half this amount** is reflected in the \$3,457,206 shown above since the other half of the salmon is landed, and the value accredited to the fisheries north of San Francisco. Inclusion of this additional \$1,000,000 puts the total annual primary value of the commercial fisheries of the Bay Area on the order of \$4,500,000.

A further breakdown would show the crustacean fisheries valued at approximately \$650,000 per year and the mollusks at about \$50,000 annually, at the primary level.

Pelgen (1955 b) in evaluating the effects of a salt-water barrier on fish and wildlife, assigned a value of \$6,175,000 to commercial fisheries and \$26,500,000 to sport fisheries. These values are not directly comparable with those presented above since the later include only that portion of the ocean catch which would supposedly be influenced by a barrier in San Francisco Bay.

It has not been possible to secure reliable information on the total amount of capital invested in the

commercial fishing industry. There apparently is no agency which maintains such records. However, consultation with officials of various organizations affiliated with the commercial fishing industry has made it possible to provide an approximate magnitude of such investments. Considering also the number and size of processing plants, fishing vessels, gear and other shore property such investments would appear to exceed \$25,000,000. The value of equipment used in that segment of the fishery east of Carquinez Bridge was assessed at \$600,000 by the industry. This is the amount of claims presented to the State Board of Control for damages suffered when the legislature prohibited commercial fishing in this area in 1957.

Sport Fisheries

Salmon. An earlier study by Pelgen (1955 a) indicated anglers spend about \$10,000,000 annually on salmon fishing. Since as much as 70 percent of California's commercial salmon catch originates in the Central Valley, it appears reasonable to make the same assumption for sport-caught salmon. It is the writer's belief, however, upon considering the characteristics of the sport fishery, that the coastal salmon streams probably account for closer to 50 percent of the annual sport salmon expenditures. Thus, the gross expenditures on the proportion of the salmon sport fishery dependent on safe passage through the Bay is at least \$5,000,000 and perhaps as much as \$7,000,000 yearly. These estimates are based on the average cost and total number of days spent salmon angling. No distinction is made between king and silver salmon.

Steelhead. It was shown in the steelhead discussion that an estimated 58,000 days were spent steelhead angling in the Sacramento-San Joaquin river systems in 1953. It is reasonable to assume at least a third as many are also spent in the numerous steelhead streams of the San Francisco region. This would bring the total to about 80,000 angler days per year dependent on a fishery either originating in or dependent upon safe passage through the Bay. At the average cost of \$18 per angler day for this type of fishing, angler expenditures are on the order of \$1,440,000 annually.

Striped Bass. The average daily expenditure per striped bass angler, as determined by Pelgen, was about \$9, which when multiplied by the number of days spent fishing (2,000,000 annually) gives an expenditure of \$18,000,000 per year. Approximately \$100,000 of this is spent for party boat fares each year.

Freshwater Sport Fisheries. Estimates of the economic values of freshwater fisheries of the Region are lacking. However, Kimsey (1957) by personal interview obtained data on the daily expenditures directly related to angling for warmwater species at representative lakes throughout the State. Mahoney (1960) conducted an extensive postal survey to obtain similar data in a comparison of saltwater and freshwater angling.

The latter study showed a mean daily expenditure figure slightly higher (\$14.27) than the former (\$12.60), for freshwater fishing. Presumably this is reflection of the higher cost of trout angling, which was not represented in Kimsey's study. Mahoney's results indicate a total state-wide expenditure of almost \$227,000,000 in California on all forms of freshwater (inland) fishing and \$92,000,000 on saltwater fishing.

According to Department of Fish and Game postal surveys, roughly 20 percent of the state-wide catch of warmwater fish and somewhat less than 10 percent of the trout catch is made in the Bay counties. Assuming effort (angling days) is approximately proportional to the catch, it may reasonably be inferred that 15 to 20 percent of Mahoney's freshwater expenditure figure or between 34 and 45 million dollars is attributable to freshwater angling in the Bay Area. These figures, of course, include a portion of the silver salmon and steelhead angling expenditures previously discussed.

Saltwater Sport Fisheries. Mahoney's survey indicated the average daily expenditure for saltwater angling was \$12.51. Clark (1953) established that a little more than 2,500,000 angling days were expended on saltwater fishing north of Santa Barbara, excluding San Francisco Bay. Assuming that one-third or 825,000 of this number is attributable to sportfishing in the ocean off the Bay Counties each year, the annual expenditure of the saltwater sport fishery of Bay Area is on the order of \$10,300,000.

The distribution of angler expenditures for these forms of fishing is given in detail in Appendix I-5.

As indicated in the anadromous fisheries section there is a tremendous business built around the sport

TABLE 58
ECONOMICS OF THE BAY AREA FISHERIES RESOURCES

Resources	Level of Evaluation	
	Primary	Ultimate ¹
Commercial Fishery Products		
Salmon	\$2,000,000	\$6,000,000
Mollusks	50,000	500,000
Crustaceans	650,000	1,950,000
Fresh Fish (other than salmon)	1,760,000	5,280,000
Estimated Average Annual Commercial Value	\$4,460,000	\$13,380,000
Sport Fishing Expenditures		
Anadromous fisheries		
Salmon	\$5,000,000	
Steelhead	1,440,000	
Striped Bass	18,000,000	
All Freshwater Fishing in Bay Area ²		\$40,000,000
All Saltwater Fishing in Bay Area ²		10,300,000
Total Estimated Annual Sport Fishing Expenditure		
		\$50,300,000

¹ The ultimate level as used here refers to the value of the products to the consumer (See text for explanation).

² Anadromous sport fishing expenditures are included in these figures (See text).

fisheries of the Bay Area. Estimates of the total investment in boat liveries, berthing facilities, bait stores and so on simply are not available, but such investments must run into several million dollars. The Bay accommodates a large fleet of party and charter boats and the value of these undoubtedly exceeds a million dollars. It would seem therefore, that capital investment related to the sport fisheries of the Bay would be on the order of at least five million dollars.

Table 58 is a summary of the angler expenditures and values of commercial fishery products originating in, or dependent upon water conditions in the Bay Area. The combined figures of \$40,000,000 for freshwater fishing and \$10,000,000 for saltwater fishing are the total for all sport fishery expenditures. Salmon, steelhead and striped bass, which have been discussed separately, are included under these two categories.

HUNTING

Waterfowl

Hunting Values. It was shown in the section on waterfowl that hunters spend on the average, \$16.32 per goose and \$8.16 per duck. Using these values and the nine year (1948-1949 to 1956-1957) average annual waterfowl kill in the Bay Area results in an annual expenditure on the order of \$6,500,000 for ducks and \$420,000 for geese for a total of \$6,920,000. Pelgen (op. cit.) on the basis of the 1953 kill evaluated the Bay and Delta waterfowl at \$10,500,000 annually.

Duck Club Investments. Private investments related to wildlife are mostly limited to refuges and hunting clubs. About the only known value which can be assigned to this category is the value of waterfowl club lands. As indicated in the waterfowl section, there were 242 duck clubs with an aggregate of 68,320 acres of land in the Bay Area. At an assessed value of \$150 to \$300 per acre the total investment in such lands ranges between 10 and 20 million dollars. For working purposes the intermediate value of 15 million dollars was used in Table 60.

Other Game Species

Separate studies for other game species are not available, but an economic study by the Department of Fish and Game of 1955 hunter expenditures indicates that \$168,000,000 was spent by sportsmen on all forms of hunting. The mean cost of a day's hunting was found to be \$18.97.

Game bag estimates indicate 10 percent of the deer, 8 percent of the rabbits and squirrels, 8 to 10 percent of the quail and a little less than 10 percent of the pheasants, doves and pigeons are consistently taken in the nine Bay counties. Because of the close agreement an arbitrary average of 10 percent of the state-wide totals is assumed for purposes of computation. It is further assumed effort (hunting days) and hence expenditures are roughly proportional to the game kill

statistics. Therefore, 10 percent of the total state-wide expenditure or \$16,800,000 can be attributed to hunting pursuits in the Bay Area.

The above estimate includes waterfowl hunting expenditures. Because the Bay Area contributes a considerably larger proportion of waterfowl to the state-wide bag (25 percent) as compared to other species (10 percent), and because of the greater expense involved in waterfowl hunting, the estimate should be revised to reflect the difference of such expenditures in the Bay Area.

This can be done by deducting the known state-wide waterfowl expenditures from the total state-wide hunting expenditures and allotting the correct proportion of each to the Bay Area. The revised total expenditure in the Bay Area, arrived at by this process, amounts to almost \$20.5 million annually rather than \$16.8 million. The figures are shown in Table 59a.

The furbearers of this area contribute an additional small amount to the fish and wildlife economy each year. Since 1921 the average annual value of the raw furs has been about \$8,000 as compared to \$123,000 for the State.

The economics of the game resources are summarized in Table 59-b.

TABLE 59a

GAME RESOURCE ECONOMICS ¹

	Bay Area	State Total less Bay Area	Statewide Total
Unweighted total all			
Hunting Expenditures	16.8 (10%)	151.2	168.0
Total Waterfowl			
Expenditures	7.0 (21%)	26.5	33.5
All Expenditures			
Except Waterfowl	13.5 (10%)	121.0	134.5
Weighted Total			
All Expenditures	20.5 (12%)	147.5	168.0

¹ Expenditures in millions of dollars.

TABLE 59b

SUMMARY OF ECONOMICS OF BAY AREA GAME RESOURCES

Estimated annual waterfowl hunting expenditures...	\$7,000,000
Estimated annual expenditures for all other types of hunting	13,500,000
Average annual value of fur resources.....	8,000
	\$20,508,000

MANAGEMENT ECONOMICS

Further economic treatment involves the cost of maintaining, protecting, investigating, and enhancing the fish and wildlife resources of the Bay Area. A basic evaluation of the costs involved has been obtained through the cooperation of the U. S. Bureau of Reclamation, U. S. Fish and Wildlife Service, State Department of Water Resources, and the appropriate regional offices of the Department of Fish and Game. Expenditures fall into two broad categories, capital outlay and management costs. A major share of the former includes large expenditures on anadromous fish facilities, patrol boats, and land purchases. Manage-

ment expenses are largely taken up by wildlife protection, administration, salaries and the operational and maintenance costs of the larger installations.

A review of the capital outlay expenditures indicates a minimum of \$16,300,000 either spent, allocated, or proposed for fish and wildlife projects. Of this amount, completed projects account for over \$11,000,000, more than \$5,000,000 worth of projects are contemplated, and just over \$100,000 in projects are being constructed. The anticipated expenditures for fish salvage facilities in relation to the Feather River Project and a Delta Salinity Control Project are included in contemplated projects.

The amounts specified are comprised of expenditures within the confines of the nine Bay Area counties, for all forms of fish and wildlife; plus expenditures in the Central Valley for the maintenance, protection, and management of anadromous fishes which pass through San Francisco Bay. A third category includes capital outlay for the purchase of land for access sites and construction of a number of boat launching ramps. Most of these are for the purpose of providing fishing access to the Sacramento River system. Finally estimates are given for capital investments or holdings of businesses dependent upon the fish and wildlife resources of the Bay Area. These are summarized in Table 60.

The figures reported herein for fish screens and ladders may be considered conservative since they are

based on the initial costs of the structures and numerous small screens and ladders have either been omitted or not assigned a value. Furthermore, many fish ladders and screens were built by private interests in compliance with state laws, and for which the Department of Fish and Game does not have cost figures.

A tabular summary of the economics involved in the administration of the fish and wildlife resources of the Bay Area or dependent upon its waters is given in Table 60. The individual projects are listed in Appendix I-7.

TABLE 60

SUMMARY OF ECONOMICS OF FISH AND WILDLIFE
RESOURCES OF THE SAN FRANCISCO BAY AREA

Resource	Annual Value
Commercial Fishery Products ¹	\$13,300,000
Sport Fishing Expenditures.....	50,300,000
Game Expenditures	20,508,000
Total Annual Value.....	\$84,108,000
Capital Outlay and Investments	
Private Commercial Fishing Interests.....	\$25,000,000
Private Sportfishing Interests	5,000,000
Private Waterfowl Club Lands.....	15,000,000
	\$45,000,000
Governmental Agencies	\$16,304,815
Total Investment	\$61,300,000
Annual Operation and Maintenance Costs.....	\$1,124,000

¹ Value at intermediate consumer level to compare with gross expenditures.

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