Chapter 2

AN ECONOMIC ESTIMATE FOR SPORTFISHING ON SAN FRANCISCO BAY

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Introduction

San Francisco Bay is a valuable resource because it provides people with recreational and aesthetic pleasure, sustains commercial fishing, and is the home for many species of flora and fauna. Like other natural resources and habitats, the Bay's continued healthy existence is threatened by human activities. Of major concern are the many water projects which divert freshwater river inflows away from the Bay to central and southern California. This decreased inflow has resulted in increased salinity and concentration of pollutants, and affects many users of the Bay. At the present time, legislators are debating whether to set water quality standards to regulate the amount of freshwater coming into the Bay.

A tool sometimes used by officials to formulate policies affecting threatened natural resources such as San Francisco Bay is an economic evaluation of the resource. In the case of the Bay, for example, legislators could make a decision on where the water should go based in part on the economic benefit received by the users of the water. Making this type of evaluation is a difficult task, however, because no two people place the same value on what these benefits are. Furthermore, people do not agree on the best methods for estimating these values. Nevertheless, it is possible to estimate an economic value for San Francisco Bay as a resource based on recreational costs and benefits.

The objective of this study is to obtain a dollar value for the benefits received by recreational fishermen who fish on San Francisco Bay. This value is for one sector of the total economy supported by the Bay, and therefore is just one contribution to the overall economic assessment of San Francisco Bay.

Past Studies

This report is based primarily on two major studies. One is by Rowe et al. (1985) entitled, "Valuing Marine Recreational Fishing on the Pacific Coast." Its main objective was to estimate gross and net economic values for typical trips and in-aggregate across all trips by fishing mode (beach, bank, man-made structures, party boats, rental and private boats), and by region (northern and southern California, Oregon and Washington). The second major study used for this report is "Parks and Recreation Information System" (State Department of Parks and Recreation, Planning Division, 1980), referred to herein as PARIS. It estimates sportfishing participation days for San Francisco Bay.

Methodology

Most economic evaluations of recreational activities such as sportfishing are based in part on some form of estimated gross and net economic values. Gross economic value is defined in the Rowe study as the "total willingness to pay" by sportfishermen, and includes actual expenditures, travel costs and "uncaptured values" related to participating in the sport. Uncaptured values are the benefits received from sportfishing that do not have dollar figures associated with them, such as aesthetics of the site, relaxation and excitement. They are important values because they indicate the magnitude of the benefits received, even when no fish are caught. Net economic value is defined as the total willingness to pay minus actual expenditures and travel costs. Therefore net economic value is a measure of the benefits, or what economists call consumer surplus (Rowe et al., 1985).

There are a variety of ways to make economic evaluations using gross and net values. One can estimate total expenditures per day and multiply by the number of participation days per year at a site. This gives a figure for estimated dollars spent by fishermen engaging in the sport at a particular site per year. However, this type of analysis leaves out the consumer surplus, an important value to consider when evaluating a specific site. The consumer surplus captures the unique benefits that a fisherman receives from fishing at a particular site.

The problem with considering expenditures but not consumer surplus is that expenditures alone do not measure the value of having, for example, San Francisco Bay an available site for fishing. The Bay may be a site that a fisherman wants to fish at above all other sites, and therefore he may be willing to spend $30.00 for one day of sportfishing on a party boat, knowing he may not catch a fish. But he knows he will be receiving personal benefits from being out on the Bay: fresh air, aesthetics, proximity to a big city, relaxation. Consumer surplus measures how much more he would be willing to pay than he actually has to pay for fishing at San Francisco Bay. If San Francisco Bay were not an available site for sportfishing, consumer surplus would reflect the value that would be lost because no one could use the Bay.

The estimates for consumer surplus provided in this report rely upon a variation of the travel/cost method of analysis. This method has been used extensively to estimate demand for benefits at a specific recreational site by recognizing that visits to a site will vary according to travel costs, travel time, characteristics of the site, characteristics of the individual and expected fish catch. A generalized presentation of this demand estimation is the function:

$$V = f (I, S, T, C, E)$$ (adapted from Rowe et al., 1985)

where: V = number of visits to a site
I = characteristics of the individual
S = characteristics of the site
T = travel time
C = travel costs
E = expected fish catch

Once this information is obtained, the results can be presented graphically where visits to a site are a function of the travel/cost variables (Rowe et al., 1985). After employing regressional analysis, a statistical technique for fitting the best line to a series of points, one has a demand curve for a recreational site. This demand curve may be used to obtain the consumer surplus from changes in any of the travel/cost variables.

The particular travel/cost model used in the Rowe study is the multinominal logit model. Similar to other travel/cost models, the multinominal logit model is based on the demand function for estimating benefits received from a particular recreational site. The multinominal logit model obtains values for these benefits, the consumer surplus, based on the probability that an individual will take a trip to a specific site under vaious scenarios regarding the site characteristics (e.g., fish stock, scenic beauty, availability of specific modes of fishing, and elimination of all fishing at the site). For this report the scenario used is the elimination of all sportfishing at San Francisco Bay because this scenario captures the total consumer surplus lost if sportfishing on the Bay is unavailable.

The multinominal logit model is based on the probability that an individual will take a trip to San Francisco Bay; each time a sportfisherman goes fishing, regardless if he goes to San Francisco Bay, he obtains a certain amount of benefit from the fact that the Bay is available as a site in his set of choices. If the Bay became unavailable for fishing, the sportfisherman would forgo this benefit. Therefore, this benefit is the consumer surplus from San Francisco Bay per trip to any site. The actual way consumer surplus is translated into dollars involves a methodology developed by Dr. Michael Hanemann of the University of California, Berkeley. Details of how this is done can be found in the Rowe report.

The information necessary for determining consumer surplus was obtained by Rowe's consultants, who conducted a telephone survey of twelve coastal counties in California. The respondents gave information on participation rates, distribution of trips in terms of county of fishing site, and mode of fishing. Table 2 presents resulting consumer surplus values (in dollars) for the elimination of all fishing in San Francisco Bay after the survey information has been factored through the multinominal logit model. Once again, the resulting values are the consumer surplus for San Francisco Bay per trip to any site. The remaining four interior counties that surround the Bay (Solano, Contra Costa, Alameda and Santa Clara), have consumer surplus values that have been determined by taking average of consumer surplus from the five coastal counties surrounding the Bay; see discussion section for more detail.

Once all these consumer surplus values are obtained, the calculations for determining the total consumer surplus for sportfishing on San Francisco Bay per year can be carried out, as follows:

Step (1)

$$X_n = \frac{(Y_n)(Z)}{W}$$

where:

X_n = average individual consumer surplus per trip to San Francisco Bay

Y_n = average individual consumer surplus for San Francisco Bay per trip to any site in northern California

Z = number of trips made to all sites in northern California per year (Table 1)

W = number of trips made to San Francisco Bay per year (Table 1)

Step (2)

$$\sum_{n=1}^{16} X_n = U$$

where:

U = total average consumer surplus per trip to San Francisco Bay

Step (3)

$$(U)(W)(CPI) = T$$

where:

CPI = Consumer Price Index

T = total consumer surplus for San Francisco Bay per year

In step (1) sixteen X values are obtained because there are sixteen Y values (Table 2). Y is multiplied by Z because Y is the consumer surplus for San Francisco Bay per trip anywhere in northern California, and multiplying by Z gives consumer surplus for San Francisco Bay exclusively. Then, dividing by W, one obtains the consumer surplus per trip to San Francisco Bay. The summation of the sixteen values is U. This is the total average consumer surplus per trip to San Francisco Bay. Next, U is multiplied by W, the number of trips made to the Bay per year (Table 1). Finally, to update the values to 1985 dollars, these figures are multiplied by the Consumer Price Index. The resulting value is the total consumer surplus for sportfishing on San Francisco Bay in 1985.

Following these calculations, projections are made for the consumer surplus for sportfishing on San Francisco Bay for the years 1990, 1995 and 2000, based on the PARIS (1980) model demand projections for sportfishing activity on the Bay. In the discussion section of this report, the limitations inherent

in doing an evaluation of this kind are presented. This is followed by a comparison of the total consumer surplus for sportfishing on San Francisco Bay in 1985 with values of other visitor activities in San Francisco area. Finally, recommendations are given for improving this analysis, and for how the resulting values can be put to use.

Results

Tables 1 and 2 present the data from the Rowe and PARIS studies necessary for the calculations.

Table 1

Trips made in 1985
(variables Z and W)

Trips to all sites in northern California	(1)	Z = 3,641,124
Trips to San Francisco Bay	(2)	W = 2,589,097

Sources: (1) Rowe and others, 1985
(2) State Department of Parks and Recreation, Planning Division, 1980

Table 2
Average Individual Consumer Surplus for San Francisco Bay per trip to any site in northern California
(variable Y)

County of Origin	Y value ($)
San Luis Obispo	0.12
Monterey	1.94
Santa Cruz	4.23
San Mateo	6.90
San Francisco	6.45
Santa Clara	6.68*
Alameda	6.68*
Contra Costa	6.68*
Marin	6.96
Sonoma	4.60
Solano	6.68*
Napa	8.48
Mendocino	2.20
Humboldt	0.30
Del Norte	0.06
Sacramento	0.95

Source: Rowe and others, 1985

*Average consumer surplus for five Bay Area counties included in Rowe report; see Discussion

The resulting value for U is $99.33, the total average consumer surplus per trip to San Francisco Bay. When this is multiplied by the total number of trips made to San Francisco Bay in 1985, W, and then multiplied by the Consumer Price Index (1.13 from the Bureau of Labor Statistics), the final value is $290,602,756. This is the dollar value for consumer surplus that sportfishermen received by using San Francisco Bay in 1985.

Projections for the future consumer surplus value for sportfishing on San Francisco Bay can now be obtained. Based on the PARIS model sportfishing demand projections and the consumer surplus values from the Rowe report, projections for consumer surplus for sportfishing on San Francisco Bay in 1990, 1995 and 2000 are $318 million, $314 million and $364 million, respectively. The major indication here is that as population in California grows, demand for sportfishing on San Francisco Bay will increase, resulting in an increase in consumer surplus value.

Discussion

The accuracy of the calculated values are partly dependent on the accuracy of the reports on which they are based. There are several inherent limitations of the Rowe report that must be kept in mind. One is that "preservation values" have not been taken into account. Preservation values of a resource are the dollar amount that people are willing to pay for protection of the resource into the future. Although these types of values are difficult to quantify, they are of substantial importance. For example, one study mentioned by Rowe and others (1985) showed that for every dollar spent sportfishing, people were willing to pay additionally half that amount to have the fishing resources protected. A second limitation of the Rowe report is that the analysis leaves out the value of time spent travelling and fishing. Most analyses assume the value of time to be the hourly wage for each individual (Rowe et al., 1985). Thirdly, the survey taken for the Rowe report collected little data on sportfishing trips made specifically for catching striped bass and salmon. These two species of fish, popular with sportfishermen, are often found in San Francisco Bay. As a result, fishermen may prefer San Francisco Bay over other fishing sites. Unfortunately, the effects of this limited data cannot be determined from the available information (Hanemann, 1986).

The Rowe study provides consumer surplus values for coastal counties only. Therefore, to determine Y values for those interior counties directly surrounding the Bay (Alameda, Contra Costa, Solano and Santa Clara), the average consumer surplus of the five coastal counties surrounding the Bay was assigned to those interior counties. According to Dr. Michael Hanemann, the Y values are based in part on distance from the site; assigning average values for the interior counties is valid because they all surround the Bay, and have relatively equal access. The limitations described above are not the only ones inherent in this study; others, less important or more complex in nature, can be found in the Rowe report.

As shown above, consumer surplus for sportfishing on San Francisco Bay in 1985 is approximately $291 million. For this number to be meaningful one should compare it to values associated with other

activities in the Bay Area. Tourism and conventions generate many millions of dollars. According to the San Francisco Statistical Abstract (1980), and updated to 1985 dollars, visitors to San Francisco spent approximately $558 million on restaurants, motels, hotels, food and beverage, $88.7 million on entertainment, and about $25 million on sightseeing.

Conclusion

It is important to consider the potential economic loss caused by declining water quality in San Francisco Bay. This report has determined what the loss in consumer surplus would be if San Francisco Bay was not available for sportfishing. To obtain the overall impact that sportfishing has on the economy, it would be necessary to combine yearly expenditures by sportfishermen who use the Bay with estimates of consumer surplus. To determine further the impacts sportfishing has, one might want to consider multiplier effects, that is, how changes in sportfishing costs and benefits filter through the rest of the economy. Additionally, it would be beneficial to obtain gross and consumer surplus values for other industries supported or affected by the Bay, such as commercial fishing, tourism, real estate and boating. With all these different values associated with the Bay, legislators could begin to make clear and rational decisions about how the water in California should be allocated.

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