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TECHNIQUES FOR ESTIMATING DOLLAR IMPACTS FROM MARINE RECREATIONAL ACTIVITY

Isobel C. Sheifer

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ABSTRACT. To improve the economic analyses in our assessments, I set out to select a method to derive dollar values from recreational participation indicators and changes in these indicators due to environmental events. I selected the "unit-day value method" because I thought it was the most efficient means to assess impacts at the direct level of expenditure. Using the method, I multiplied the unit-day values (in dollars) by recreational participation indicators (in usage units) for specified time periods and present the resulting dollar figures as the direct impact. I then applied the method in two test cases involving San Francisco Bay park attendance data for 1985.

1. INTRODUCTION

Although economic impacts of marine recreational activity and weather-related changes in this activity are significant to the evaluation of coastal resources, methods of quantifying these impacts for assessment purposes have not yet been established. The ability to quantify these statistics would add to the understanding of the impacts of environmental events on the economy. Readers of environmental literature relate more directly to the dollar impacts of events than to simple participation figures. While readers may be interested in knowing that a weather event caused a drop of thousands in park attendance, decision processes require that this factor be stated as a loss of a given number of dollars to the economy.

The availability of dollar figures associated with marine recreational activities extends beyond their application in assessing impacts from single weather events. Such dollar figures may be used to evaluate an entire activity and its significance in the economy or to evaluate a series of activities. Walsh and Loomis (1987) in the report of the

President's Commission on Americans Outdoors stress that assessment of the economic impacts of recreational participation is important to natural-resource decisionmakers. For example, a dollar amount associated with recreational boating expressing registrations in a particular state as expenditures in any year would be useful to decisionmakers called upon to choose between alternate uses of waterfront property. Although other types of economic analyses of recreation may also be valid, impact analysis is a useful tool.

This paper examines one method for establishing dollar impacts from marine recreational participation indicators and applies it in two examples.

2. METHODOLOGY

2.1 Selecting An Impact Methodology

Many of the methods currently used that associate dollar figures with recreational participation are related to potential demand or to valuing aesthetic qualities. The dollar figures produced by these methods are frequently identified with a market or nonmarket good associated with the recreation, and the figures are developed through surveys. Such methods and their resulting figures are used, generally, for resolving questions about the siting of recreational facilities or for the management of natural resources such as wildlife. Techniques such as the "contingent valuation method" and the "travel cost method" are used in these cases. Although these methods do employ some measurement of current expenditures among surveyed individuals, they use these data to project future expenditures or usage. None of these demand and valuation measures, therefore, is appropriate in assessing actual dollar impacts from recreational participation or changes in such participation. The following discussion focuses on establishing a method to be used in determining the dollar figures associated with actual expenditures involved in recreational participation.

2.2 Levels of Impact Analysis

The first question that must be resolved in establishing dollar amounts associated with attendance indicators is how many levels of economic impact one wishes these figures to address. Expenditures made for recreation result in impacts on economic sectors or jurisdictional levels beyond the initial expenditures. This process is referred to as a "multiplier" effect. Analysis of multipliers is a relatively common method for evaluating the regional impact of specific types of economic activities. For example, participation in recreational fishing requires travel to a suitable fishing area, the purchase or rental of fishing equipment and lures or bait, and the purchase of food. However, impacts from these activities multiply. Total economic activity exceeds the initial expenditures because sales in one business affect other firms that supply goods and services to the firm that originally sold the equipment or provided services to the traveler. People are involved in the process because they supply labor and receive wages that are spent on other goods and services. Businesses and individuals pay taxes. Thus, the economic impacts of recreational fishing may extend from local, to state, to regional, and even to the national level. A multiplier is computed by dividing total economic impacts, generally determined through the use of an economic model for a specified jurisdiction, by direct or first-level expenditures.

Despite the unquestioned value of using multipliers for certain types of economic analyses, I limit the dollar figures to direct or first-level economic activity since this is the most expedient way of evaluating effects of environmental events. Results from such calculations may be assessed immediately without reference to models, and such results are easily understood by a wide audience of readers. This paper establishes dollar values for indicators of initial expenditures for participation in a given recreation. To arrive at these figures I use basic data gathered by other researchers, organizations, or jurisdictions.

2.3 Unit-Day Values

To determine dollar values for activity indicators, I selected the "unit-day value method," which employs standard attendance or usage figures for recreation and daily participation expenditures known as unit-day values. A unit-day value is an average dollar value for expenditures by a participant during a day of engaging in a particular activity or group of activities in a specified economic jurisdiction. The unit-day value may also be called a participation-day or activity-day value. Dollar values may be determined by any jurisdiction, organization, or individual researcher. In this study, I have used data collected by the State of California.

Both locally gathered unit-day values and nationally collected values have shortcomings in particular applications. Local values frequently are not comparable from jurisdiction to jurisdiction since criteria for establishing values are set independently. Figures collected nationally frequently mask local variations. Each research sponsor or jurisdiction establishes its own criteria in setting unit-day values. Despite these drawbacks, unit-day values provide the most readily available and useful data for converting activity indicators into dollar impacts.

3. APPLICATION OF THE UNIT-DAY VALUE METHOD BY CALIFORNIA

The California Department of Recreation and Parks (1984) estimated away-from-home recreation expenditures by Californians in the state for 1982 using a methodology approximating the unit-day value method. Travel expenditures were derived from these sources: a 1980 recreation needs-analysis of trip data by the State of California; travel expenditure data for recreation, entertainment, and sightseeing from the U.S. Travel Data Center; and Federal Highway Administration data on the cost of owning and operating automobiles and vans in 1982. On the average, travel expenditures were found to amount to about half of the total participation costs. Other expenditures necessary for participation in each recreational activity were calculated from data collected by the National Sporting Goods Association for 1983 and from surveys of trade organizations and recreation establishments throughout the state. The unit-day values that resulted from these calculations are shown in Table 1.

Once the unit-day values are obtained, these values may be used in the given application. The most general application is to find total dollar amount for a specified time period for a given recreational activity or group of activities. The formula for this is

Impact ($) = [unit-day value] X [participation volume]

In the California application of the data, total annual expenditure estimates for 24 listed activities were determined by multiplying average daily expenditures by total annual participation days for the activities derived from a statewide recreation needs-analysis study. Annual participation expenditures for these predominantly outdoor recreation activities totaled about $19 billion in 1982.

4. THE UNIT-DAY VALUE METHOD APPLIED TO ASSESSMENT DATA

Two applications using San Francisco Bay park statistics that appeared in the Marine Environmental Assessment, San Francisco Bay, 1985 Annual Summary (Dowgiallo et al., 1986) are presented to show (1) the economic value of state park attendance in 1985 in the nine-county area surrounding the Bay and (2) the dollar value of lowered park visits at Golden Gate National Recreation Area (GGNRA) resulting from a cooler and wetter March 1985 compared with March 1984.

4.1 Economic Value of State Park Attendance

Park usage is a large component of marine coastal recreation. Surveys have frequently indicated that people prefer recreations with a water orientation, even if contact with the water is not a part of the usage. Many of the state parks in the

Table 1. Estimated away-from-home recreational expenditures by Californians in California, 1982. Source: California Department of Parks and Recreation (1984).

Activity*	Avg. Activity Day Expenditure Per Person**	No. of Activity Days (Million)	Total $ Spent on Activity (Million)
Attending sports events	$12.42	22.4	$ 278.0
Bicycling	3.90	118.3	461.0
Boating	33.53	38.1	1,277.0
Bowling	8.91	33.7	300.0
Camping	29.05	49.7	1,444.0
Court ball	4.09	57.2	234.0
Crafts and hobbies	7.89	47.9	378.0
Fishing	32.00	51.9	1,661.0
Golf	23.89	30.7	733.0
Hiking & backpacking	13.73	53.4	733.0
Horseback riding	19.78	18.5	366.0
Hunting	65.00	7.6	494.0
Jogging	3.03	219.3	664.0
Nature appreciation	12.51	64.8	811.0
Ocean & beach use	7.51	114.8	862.0
Off-highway vehicles	45.05	25.4	1,144.0
Picnicking	13.02	74.6	971.0
Pool swimming	6.56	62.6	411.0
Snow skiing	49.23	7.5	369.0
Sports activities	17.28	193.1	3,337.0
Tennis	6.90	46.9	324.0
Visiting fairs, zoos, etc.	26.93	40.6	1,093.0
Visiting scenic areas	14.56	49.2	716.0
Wall ball	8.05	26.8	216.0

* These 24 listed activities together accounted for more than 90 percent of all participation in away-from-home recreation in 1980.

** Includes expenditures for transportation, meals, and lodging for those trips over 100 miles. Near-home travel costs are estimated with a different methodology. Equipment purchase and maintenance and admission or membership fees are included where appropriate.

San Francisco Bay area are near the water.

In 1985 the number of state park visits in the nine-county Bay area was 8,024,245. Applying the methodology set out in Section 3., I first establish an average dollar unit-day value for park attendance. The 1984 California study of away-from-home recreation cited above established figures (Table 1) that were useful for this conversion. Although the San Francisco region varies somewhat from the rest of the state in terms of its higher per capita income, the resemblance of the region to the rest of the state in recreational participation patterns allows use of statewide unit-day values for gauging economic impacts of recreational activity in the region. Since in 1982 about 20 percent of the California population lived in the San Francisco Bay region, it is clear that the area already forms a significant component of the statewide averages.

Although the 1984 California study is extensive and useful, it does not have an activity-day category for park attendance. To establish a unit-day value for park attendance in the San Francisco Bay region, I identified activities in the list of activity days in Table 1 that would commonly take place in these parks. I chose five activities: jogging, bicycling, ocean-and-beach usage, picnicking, and nature appreciation. Jogging, bicycling, and ocean-and-beach usage were selected because they were among the activities having the largest number of participation days. The category of sports activities, although very high in rank in terms of participation days, was not included because the extent to which such activities may have taken place in parks was unclear. Also, the average activity-day expenditure of $17.28 for sports activities seemed too high to associate with such activities in parks.

In selecting activities to be included in a park-attendance day, no attempt was made to choose those activities associated with high daily expenditures. Thus, the final unit-day value to be computed for San Francisco Bay region park attendance will be conservative, and analyses using the figure may understate impacts.

The number of activity days in 1982 for each of the five selected recreations divided by the total number of activity days for the five recreations provides relative weights which approximate a single participation day. The average daily expenditure for each of the five activities was then multiplied by the appropriate weight and the results totaled. The resulting figure was then considered representative of an average park attendance activity-day dollar value in the area. This average figure was then adjusted for inflation using year-to-year percentage gains in the Consumer Price Index between 1982 and 1985.

Computation of this park unit-day value appears below:

Activity	Statewide California Attendance (Million days)	Weight (Share of total atten-dance)	Average Daily Expenditure	Weighted Product
Bicycling	118.3	.200	$ 3.90	$ .78
Jogging	219.3	.371	3.03	1.12
Nature apprec.	64.8	.109	12.51	1.36
Picnicking	74.6	.126	13.02	1.64
Ocean & beach	114.8	.194	7.51	1.46
Total	591.8	1.000		$6.36
1983 inflation adjustment:		3.2%		= $6.56
1984 inflation adjustment:		4.3%		= $6.85
1985 inflation adjustment:		3.6%		= $7.09

Multiplying this $7.09 figure by the number of 1985 state park visits in the San Francisco Bay region, I arrived at a dollar figure of almost $57 million in annual direct expenditures attributable to these visits in the San Francisco Bay area.

4.2 Dollar Impacts from Weather Events

Weather anomalies such as warm winter months or cold summer months affect the use of outdoor facilities and have economic impacts. Individual severe storms or long periods of rainy weather cause negative impacts on recreation; extended periods of favorable weather cause positive impacts.

Golden Gate National Recreation Area (GGNRA), located in San Francisco, is the national park with the largest annual attendance in the U.S. Within its boundaries are facilities for a variety of recreational experiences. Some of these activities, such as visiting the beach and taking boat trips to Alcatraz Island, are very weather sensitive. Therefore, GGNRA presents a good test case to examine weather impacts on attendance.

4.2.1 Park Attendance and Weather in March 1984 and March 1985

Total attendance at GGNRA rose by about 1.6 million visits between 1984 and 1985. Figure 1 depicts 1984 and 1985 attendance by month, and Figure 2 graphs the percentage change in attendance for each month comparing 1985 to 1984. The average rise in monthly attendance in 1985 was 10.5 percent. Part of this rise in attendance is attributable to population growth. The nine-county San Francisco Bay region grew in population by about 8 percent between 1980 and 1985. Tourism to the city of San Francisco, which rose about 3 percent between 1984 and 1985 as estimated by the San Francisco Convention and Visitors Bureau,

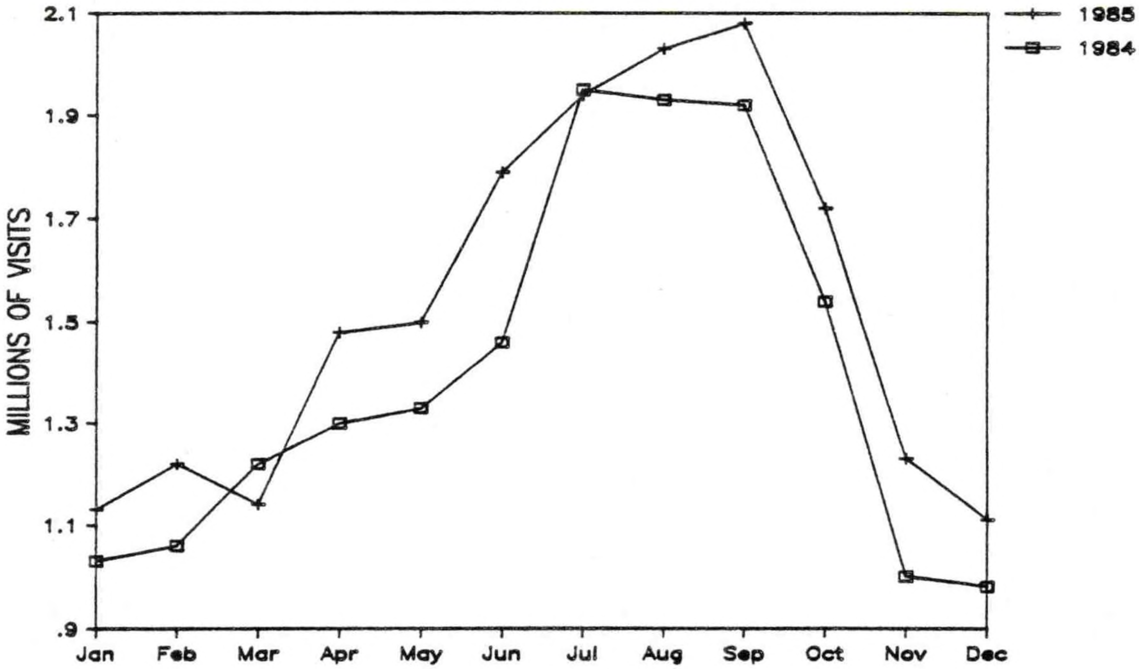

Figure 1. Monthly attendance, Golden Gate National Recreation Area, 1984 and 1985. Data from National Park Service.

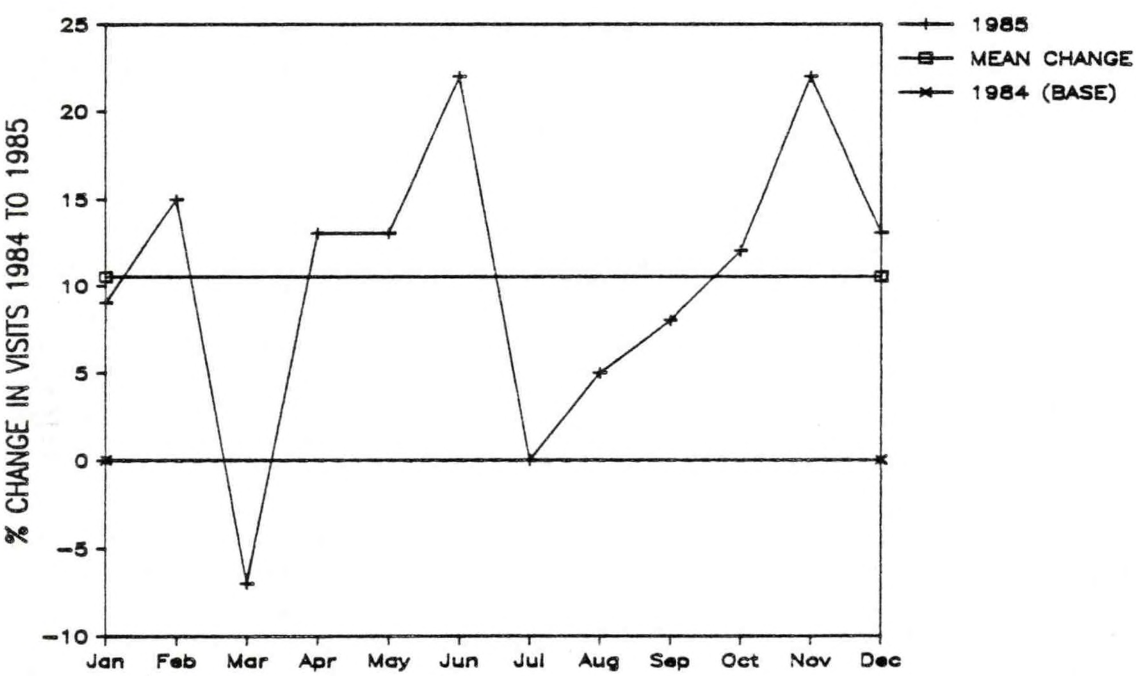

Figure 2. Percent change in monthly visits to Golden Gate National Recreation Area from 1984 to 1985.

also played a part in the GGNRA attendance rise. The growing popularity of park activity also contributed to the attendance growth. However, four months in 1985 showed significant departures from this average which cannot be explained by any of these overall trends. June and November both had increases of 22 percent. March 1985 showed a decline of 7 percent from the previous year, and July 1985 attendance was about the same in both years.

My discussion of economic impacts from marine recreational activities focuses on the decline in park attendance at GGNRA in March 1985. March 1985 was both cooler and wetter overall than March 1984 as measured at the San Francisco International Airport. During March 1985 only 8 days had positive average temperature departures from daily normals, and most other days of the month had negative departures ranging from 1 to 6 degrees Fahrenheit ($^{\circ}$F). In March 1984 only 2 days were below normal, while the remaining 29 days of the month were from 2 to 9°F above normal. The monthly means for 1984 and 1985 were +4.2°F and -1.4°F, respectively. Thus March 1984 was 5.6°F warmer overall than March 1985.

In 1985 there were 13 days with precipitation greater than or equal to .01 inch of rain; in 1984 there were 6 such days. March 1985 had 3.30 inches of rain, a positive departure from normal for the month of 0.66 inches. March 1984 had only 1.36 inches of rain, a departure of -1.28 inches from normal.

March is a marginal month for outdoor activities in the San Francisco Bay region. The attendance decline at GGNRA during the cool and wet March 1985 when compared to a warmer and drier March 1984 is not surprising.

4.2.2 Assessing the Economic Impacts

To assess the economic impact of the weather-related drop in attendance in March 1985 using the unit-day value method, I convert the GGNRA March 1985 decrease in park attendance to dollar figures using the $7.09 unit-day value for this activity computed in Section 4.1. Monthly figures are not available in this unit-day value format. The computed dollar loss due to the decline of 83,765 visits between March 1984 and March 1985 was about $595,000.

A more accurate estimate of the losses due to the decline in attendance in March 1985 is available by considering the average rise in GGNRA attendance during 1985. Evaluating the impact in terms of the attendance expected if March followed the general 1985 increase, I used a least squares regression to determine the projected attendance.

With 1985 monthly attendance as the dependent variable (y axis) and 1984 monthly attendance as the independent variable (x axis), I used standard regression routines available in SuperCalc3™ and RS/1. Both software packages yielded the same results. This procedure was not meant to imply an actual dependence of one variable on another, but was simply used as a technique to compute the trend and derive a projected March 1985 figure from it. The computed r^2 value of .922843 indicates a very good fit of the regression line with a high reduction of the variance. The regression line and the data pairs from the computation are shown in Figure 3.

To obtain the projected park visits, I substituted the figures obtained from the regression in the formula $y = a + bx$ where

y = the projected 1985 monthly attendance
a = the intercept
b = the slope
x = the actual 1984 monthly attendance

Thus

$$y = 188{,}209 + .962052(1{,}222{,}122) = 1{,}363{,}954$$

is the projected attendance in March 1985 if normal weather had occurred. These projected March 1985 visits were approximately 225,600 greater than those that actually occurred. Projected and actual visits for 1985 are graphed in Figure 4. Multiplying the difference between the projected attendance for March 1985 and the actual attendance by the $7.09 unit-day value for park attendance already established, I estimate the total economic losses from the weather-related decline in March 1985 visits to be about $1.6 million.

5. CONCLUSIONS

A methodology for converting recreational indicators into dollar figures has been demonstrated with an application to the impacts of environmental events on the recreational economy. The methodology has been used in estimating dollar amounts for park attendance in the San Francisco Bay area.

The method allows estimation of local economic impacts of environmental events using aggregate survey data. For areas where local expenditure data do not exist, but attendance data do exist, one can still estimate economic impacts using the aggregate data. The method allows estimates of economic benefit for development of a resource area with varied scenarios of attendance patterns. Preliminary estimate of economic impact can be calculated in a timely manner using local initial attendance figures without the normal delay associated with development of

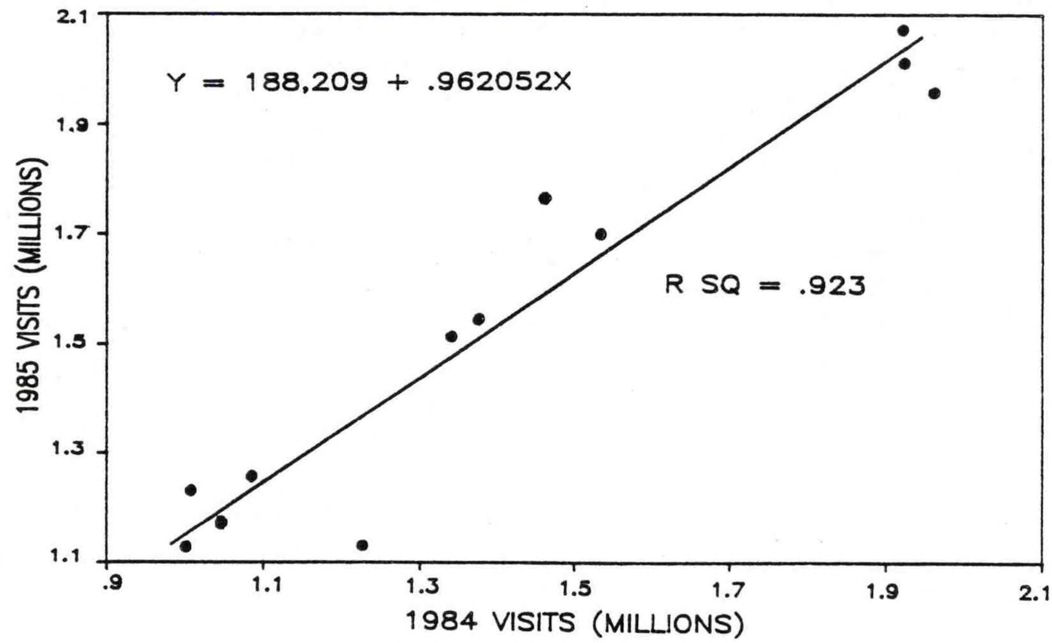

Figure 3. Least squares regression comparing 1984 monthly visits (x axis) and 1985 monthly visits (y axis) to Golden Gate National Recreation Area.

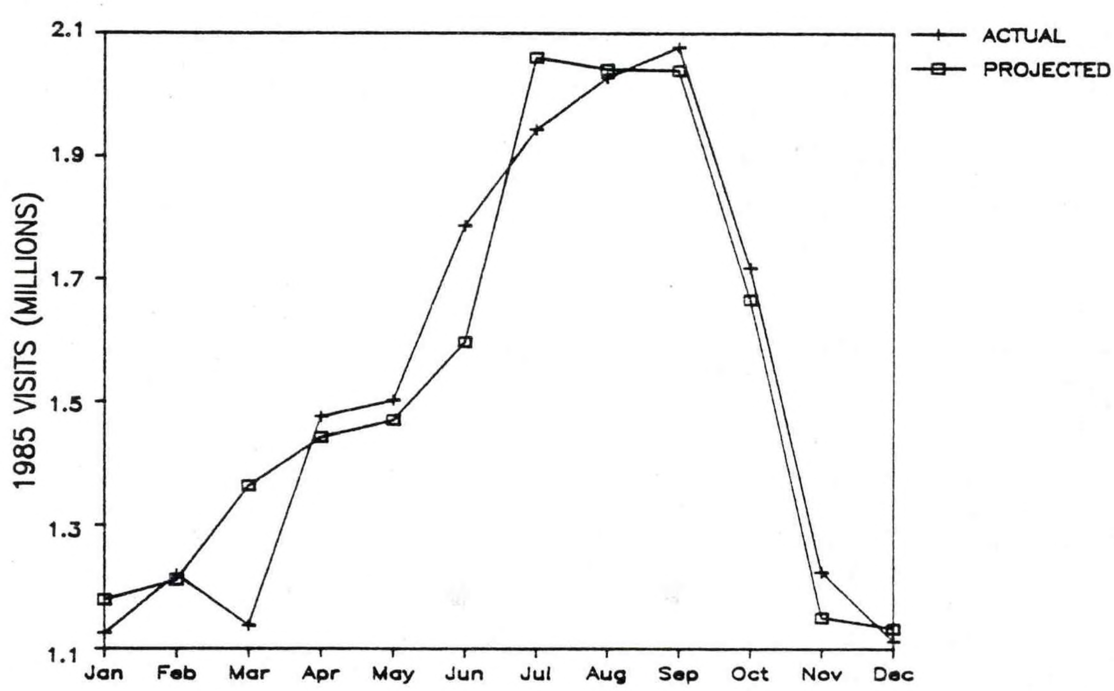

Figure 4. Projected and actual 1985 monthly visits to Golden Gate National Recreation Area.

official data through state and federal agencies. For cases where federal or state relief or tax adjustments are indicated, this method for timely estimation could be extremely helpful.

The method may be refined through development of local data. For example, if one wishes to improve the computation of the value of beach days to the San Francisco economy, it is only necessary to gather intensive data about beach activity for that particular region. It is not required that the entire state database be upgraded to improve on the local data estimates. The improvement and extension of the model can be done in limited steps.

Relative weights assigned based on aggregate data for the state may not represent those patterns of participation in specific recreational areas. In many cases unit-day figures and total usage data do not exist, hence extension of the method to other regions may be limited. Finally, data quality in the aggregate usage tables may vary considerably both from state to state and within a given state.

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