IMPACTS OF OUTER CONTINENTAL SHELF (OCS) DEVELOPMENT ON RECREATION AND TOURISM

VOLUME 3:

DETAILED METHODOLOGY

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I. INTRODUCTION

The final report for this project is presented in five volumes:

- **Volume 1: Executive Summary**
- **Volume 2: Final Report - Main Volume**
- **Volume 3: Detailed Methodology Review**
- **Volume 4: User's Guide**
- **Volume 5: Programmer's Manual**

This volume, Detailed Methodology Review, presents a discussion of the methods considered and used to estimate the impacts of Outer Continental Shelf (OCS) oil and gas development on coastal recreation in California. The purpose is to provide the Minerals Management Service with data and methods to improve their ability to analyze the socioeconomic impacts of OCS development. To achieve that overall purpose, the project had several specific objectives.

— Provide "profiles" of 1982 economic conditions in coastal communities, and analyze the relative importance of the tourist industry in each coastal county;

— Develop a methodology for determining the effects of OCS development on coastal recreation.

   — The methodology should enable evaluation of not only the construction and operation impacts from normal OCS development, but also the potential impacts of an oil spill

   — The methodology should enable assessment of impacts on beach activities, boating and recreation fishing

   — The methodology should enable estimation of changes in recreation trips, changes in recreational spending and changes in economic value to recreationists;

— Recommend mitigation measures that may reduce the effect of OCS development on coastal recreation.

Chapter II in this volume provides a review of previous attempts to evaluate the effects of OCS development and of oil spills on coastal recreation. This review also discusses the strengths and weaknesses of different approaches that are available to accomplish the purposes of this project, and presents the rationale for the methodology selection made.

Chapter III presents a detailed discussion of the methods actually used in this study. For each component of the overall methodology several elements are described, including the theoretical foundation, data sources, methodology development and results. Chapter III also describes how the model components are linked. Readers who desire a more general description of the methodology should refer to Volumes 1 or 2.

Finally, this volume contains the bibliography for the entire study. Selected references in this bibliography have been annotated.

II. METHODOLOGY REVIEW

A. Introduction

This chapter assesses the methods available for determining the economic impacts of Outer Continental Shelf (OCS) oil and gas development on coastal recreation in California. Four analytical elements are necessary to estimate the recreation impacts of OCS development: a) estimation of the **volume of recreation** at coastal areas by type of recreation activity, as a function of OCS development; b) estimation of the **demand schedules** for recreational resources with and without OCS development; c) estimation of the **direct impacts** of recreation expenditures with and without OCS development; and d) estimation of the **indirect impacts** of recreation expenditures with and without OCS development.

Estimation of the volume of recreational activity at coastal areas as a function of OCS development is necessary to drive the other analytical elements. OCS development may cause fewer recreationists to visit a particular locality and it may shorten people's stays at a particular locality. These changes will be reflected in the demand for recreation resources and will affect the recreation expenditures in coastal communities (see Figure 3-1).

The problem of estimating demand schedules for recreational resources is different from that of estimating direct and indirect impacts of recreation expenditures. OCS development may cause people to value, in an economic sense, a recreational resource less highly than they did before the OCS development occurred. That is, the demand schedule for the recreation resource at that site may shift downward. These impacts are generally not observed in the marketplace, since there is usually no access fee or only a nominal access fee to the site (excluding the need to purchase specialized recreation equipment). However, impacts of OCS developments are registered in the market in terms of expenditures in coastal communities (and perhaps elsewhere when indirect impacts are considered).

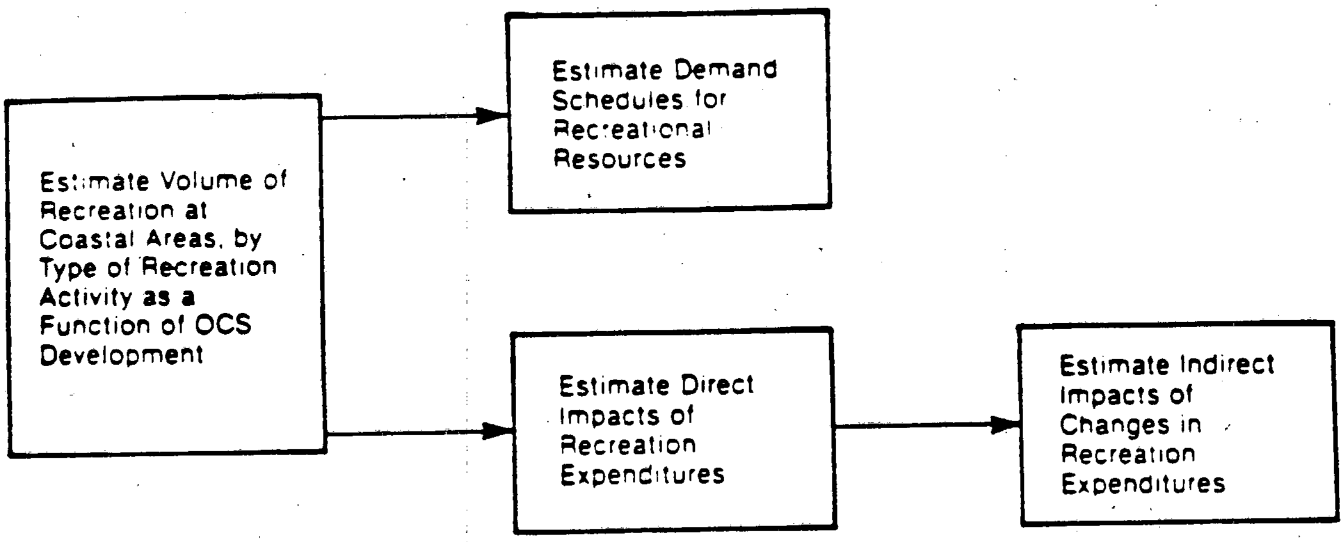
In the following section, Section B the historical record of oil spills and aesthetic impacts of OCS development is reviewed. The literature on methods for estimating these impacts is discussed in Sections C through F. The literature review is selective, emphasizing methods of analysis and problems encountered in applying various methodologies. It is also selective in that coastal recreation was stressed. Conclusions are presented in Section G. The methodology selection was based on data requirements, reliability of the component methods, cost of implementing the methods, ease of updating the data base, geographic disaggregation, and linkage of one method to another. The selected methodology is discussed in more detail in Chapter III of this volume.

The review of methodologies was undertaken recognizing that no new recreation data were to be collected by surveys or other means. Only existing data sources could be used in the analysis. Thus methods of analysis were judged on their ability to use existing data.

The data discussed cover a wide range of sources and also exhibit a wide range of applicability to the current study. The usefulness of this data depends greatly on decisions made during the course of this study — the size of the destination areas, the number of recreation activities and how they are grouped, the number and size of the activity sites proposed for analysis, and the functional form of the techniques proposed for use. In general, the smaller the activity site and more disaggregated the activity type being evaluated the more difficult to compile consistent and comprehensive data.

Figure 3-1

Overview of Economic Issues in the Impacts of OCS on Recreation



B. Impacts of Offshore Oil Development on Recreation: The Historical Record

The historical record on the impacts of offshore oil development on recreation provides a basis for choosing methods of analysis of recreation impacts. Impacts have been observed as a result of oil spills and as a result of construction activities or operation of offshore platforms. Section B.1 reviews the evidence on the impacts of oil spills on recreation and Section B.2 addresses the aesthetic impacts of offshore energy development.

1. The Impact of Oil Spills on Recreation

Several oil spills have been sufficiently documented to identify recreation impacts and three are especially well documented: the Santa Barbara, California spill in 1969, the Amoco Cadiz spill in 1978 on the Brittany coast in France, and the Argo Merchant spill in 1976 off Nantucket Island, Massachusetts.

The recreation impacts of the Santa Barbara spill were analyzed by Mead and Sorensen (1970). The impact of the spill on beach recreation was that of diverting recreationists from polluted beaches to other recreation areas. There was "no perceptible effect on tourism in southern California generally and little effect on tourism in Santa Barbara County" (p. 194). Thus, the impacts were quite localized and hard to discern at even the county level. Mead and Sorensen arrived at this conclusion by examining motel-hotel transient occupancy tax receipts on a quarterly basis from 1965 to 1970. Monthly attendance records at beaches were not conclusive, since changes in visits could be attributable to changes in entrance fees and quality of facilities, as well as to oil pollution (Note 61, p. 216).

In order to identify the localized recreation impacts of the oil spill, Mead and Sorensen turned to a survey of residents of the Santa Barbara coastal area. The mean number of visits per person to the beach in the twelve months before the spill was 27.9; in the twelve months after the spill, the mean number of visits was 20.8. This translates into a decline of 744,000 beach visits in the year following the oil spill (for persons over the age of 16). Again, however, part of this change could be attributed to fee and quality changes.

To put a dollar value on this decline in beach usage, Mead and Sorensen asked respondents to compare the value of a beach visit to that of a typical movie and concluded that a typical visit to the beach by the local populations is, on average, 1.74 times as enjoyable as a typical movie. This valuation was made before economists seriously began to estimate consumer surplus using contingent market methods, so it is not as sophisticated as the studies performed later.

The Amoco Cadiz oil spill in France was one of the most intensively analyzed accidents (Bonnieux and Rainelli, 1982; Brown, 1982; Brown, Congar, and Wilman, 1983; and Grigalunas et al., 1983). Two basic approaches were used to determine the impacts of this oil spill on recreation -- an examination of tourist expenditures and related economic activity, and an examination of recreation visits using the travel cost method.

Bonnieux and Rainelli looked at three measures of tourist expenditures over time: motor fuel consumption, the total wage bill in tourist-related activities, and deliveries of flour to bakeries. Motor fuel consumption dropped by about 10 percent in the period July through September in two departments and by about 5 percent in two other departments. Hotel and restaurant wage bills for the period July through September declined by 29.2 percent between 1977 and 1978 in the polluted western portion of the Côtes-du-Nord coast and by

10 percent in the unpolluted eastern portion of the Cotes-du-Nord coast. A decline of 10 percent was also observed in the Finistere coast and a decline of 8.4 percent occurred on the Ille-et-Vilaine coast. Based on flour deliveries, Bonnieux and Rainelli estimated that 11,605,100 nights of tourist accommodation were lost in Brittany as a result of the oil spill.

Grigalunas et al. examined real wage payments in tourist-related industries in Brittany over time to estimate the impacts of the Amoco Cadiz oil spill. Tourist-related industries are defined as retail food trade, retail non-food trade, hotels, cafes and restaurants, and consumer services. The lost wage payments in the Brittany tourist industries in 1978 were between 85 million francs (for six summer months) and 166 million francs (for the entire year). These losses are attributable to lay-offs and reduced working hours. Losses occurred in both polluted and unpolluted tourist areas.

Gardner Brown examined the number of tourist visits (per ten million resident population) to Brittany excluding persons staying in hotels for 1978 and 1979. Visit rates (i.e., visits per ten million population in the origin zone) were modeled as a function of the travel cost to Brittany and of the travel cost to the nearest alternate coastal site. The "decay" of visits with distance was greater in 1978 (the year of the oil spill) than in 1979. Brown also estimated the per person consumer surplus lost because of the oil spill using the travel cost method and found that losses were about 3 francs per visitor (about $.91 in 1982 dollars).

Brown, Congar, and Wilman also analyzed a special survey of tourists in which the surveyers first showed respondents pictures of a polluted beach and then determined their willingness to travel greater distances to a clean beach. The loss of consumer surplus for each visitor who visited a polluted beach in 1978 was estimated to be 130 francs per season.

The Argo Merchant spill occurred at sea and did not directly affect beaches on Cape Cod, Nantucket, or Martha's Vineyard. After examining expenditures by travellers to Cape Cod, Martha's Vineyard, and Nantucket, and passengers carried by ferry to the islands, Fricke and Maiolo (1978) found that tourist activities declined after the oil spill, but interviews of local merchants attributed this to Bicentennial activities drawing off visitors. Thus, the analysts concluded, "it would appear that the effects of the Argo Merchant oil spill on the economy of Cape Cod and the Islands were negligible" (p. 172). Fricke and Maiolo did discover, however, that many people were poorly informed about the oil spill but nonetheless held strong perceptions about its impact.

Other oil spill incidents have also been examined but not in as much detail. For example, the effect of the oil spill from the tanker Alvenus on Galveston Island State Park in Texas can be seen in the attendance figures in Table 3-1. The spill hit the State Park beach on August 3, 1984 and was expected to continue to affect the beach throughout the rest of 1984. The park has 1.5 miles of beach plus a camping area that was unaffected by the oil spill. Attendance dropped off dramatically in August 1984 and stayed low in September. Data for 1982 are presented as the baseline for comparison; the park was closed from August 16 through September in 1983 because of hurricane damage, so 1983 could not be used as a comparison year.

Table 3-1
Effect of Alvenus Oil Spill on Attendance at Galveston Island State Park

Month	1982	1983	1984
July	103,790	104,960	101,783
August	95,608	42,454*	14,026**
September	52,632	*	25,989**

* Park closed from August 16, 1983 through September due to hurricane damage.

** Oil spill washed up on beach on August 3, 1984 and oil was still present in September.

Source: Texas Parks and Wildlife Department.

Restrepo and Associates (1982) estimated the economic impacts of the IXTOC I and Burmah Agate oil spills on the Texas Gulf coast in 1979. However, they had only limited survey data available concerning the losses in business activities attributable to the oil spills. On the basis of surveys of businesses, they estimated a loss of about 8 to 9 percent in tourist expenditures in the Padre Island area, for example. They were also unable to identify any substitution effects for recreation as a result of the oil spills. Finally, the authors noted that the economic impacts of the oil spills were very localized, concentrated along the beach.

2. The Aesthetic Impact of Offshore Oil Production on Recreation

The aesthetic impacts of offshore oil and gas production on recreation are more subtle than the impacts of oil washing up on shore or affecting marine fishing and other recreational activities. In their survey of Santa Barbara coastal residents following the 1969 oil spill, Mead and Sorensen (1970) asked questions about the aesthetic values of the ocean and Channel Islands. Three quarters of the respondents disliked the oil platforms because they interfered with the view, indicated the potential for future oil spills, and appeared to pose a hazard to navigation. Thirty percent of the respondents said they were willing to pay $10 or more per year to put the oil platforms under water and thereby reduce the aesthetic impact.

Unfortunately, the historical record does not provide much more information on the aesthetic impact of offshore oil development. However, Baker et al. (1980), conducted a detailed study about the recreation and aesthetic impacts of potential offshore nuclear power plants. These are not visually identical to oil platforms but they are similar in that they are energy related and fairly large. Based on questionnaires administered to visitors at beaches in New Jersey, Florida and Cape Cod, Massachusetts and using an artist's conception of the nuclear plant, the authors concluded that approximately 5 percent of visitors at most would be unwilling to visit a beach because of the aesthetic impacts of the offshore nuclear power plant.

The inventory and evaluation of California coastal aesthetic resources, prepared by the Granville Corporation (1981) for the Pacific Outer Continental Shelf Office of the Bureau of Land Management provides a detailed series of aesthetic ratings for a large number of coastal segments. These ratings are a useful data base in developing an analysis of aesthetic impacts.

C. Methods for Estimating the Volume of Recreational Activity

OCS oil and gas development may change the demand for recreation at a particular site if oil and gas activities affect the aesthetic resources of that site or if an oil spill occurs elsewhere on the OCS and reaches that site. Six methods with potential for predicting recreation activity with and without OCS development were reviewed:

- gravity-type models
- trip distribution models
- attribute models
- time series
- participation models
- expert opinion

Before entering a discussion of methodology, it is useful to keep in mind the characteristics of recreation activity and recreationists along the California coast. The California Department of Parks and Recreation (1983) reported that in 1980, participation in ocean and beach activities averaged 5.56 days per capita, and about 65 percent of ocean and beach recreation days took place within one hour travel time from home. Important activities are beach combing, beach games, board surfing, body surfing, ocean swimming, and salt water fishing.

1. Gravity-Type Models

A gravity model represents the level of population interaction between two regions or locations as being directly related to the attractiveness and population of the regions and inversely related to the distance between the regions. It uses principles which are analogous to gravitational forces in physics, and hence the name. In the case of recreation models, the number of visitors from area i to recreation site j would be modelled as being directly related to the attractiveness of site j and the population at area i, and as being inversely related to the distance (travel cost) from i to j.

The gravity model and its relatives are some of the most widely used approaches to estimating the volume of recreation (visits or visitor days) at a site or sites. These models offer several advantages:

- They can incorporate the attributes of the sites of interest (e.g. beach characteristics, accessibility, OCS development etc.).

- They always incorporate the effect of distance or travel cost to the sites on the number of visits to that site generally reflecting a diminution in visits as distance from the recreationists' residence increases.

- Because of their use of distance, they are compatible with the travel cost method of estimating consumer surplus for a recreation site, to be described in Section D.1, below.

- They can incorporate the effects of site substitution as would occur when recreationists switch to alternative sites after an oil spill.

- They can incorporate the effects of characteristics of the visitors or of the visitors' zones of residence on rates of visitation to particular sites.

There are several general forms of the gravity-type models which can be used, depending on whether one site or several sites are analyzed simultaneously (e.g. only one beach, or a set of beaches) and whether the units of observation are individuals or origin zones such as counties. In this study of the effects of OCS development near the California coast, the form of greatest interest is that involving several recreation sites and using origin zones as units of observation. There are two reasons for this: 1) the substitution of recreation sites is an important component in determining the impacts of OCS development, and several sites would have to be included in the model simultaneously. 2) information on travel patterns of recreationists by area of origin was more complete than information on individuals' recreation choices that coula be adopted for this project. In fact, the California Department of Parks and Recreation was able to provide travel pattern data from their 1980 Recreation Travel Pattern Survey. This data set indicates travel patterns by socioeconomic characteristic, by trip purpose and by travel time, for ten origin zones in California. (Arnold, Levy, Carey, 1982).

A typical gravity model is of the form:

$$V_{ij}^{r} = f^{r}(C_{ij},A_{j},P_{i},X_{i},Z_{i},T_{ij})$$

where

V_{ij}^{r} is the number of visits or visitor days from origin area i to recreation site j for activity r.

C_{ij} is the travel cost from i to j.

A_j is a vector of attributes of site j (such as beach frontage, presence of offshore oil platforms, etc.)

P_i is the population of the origin zone i.

X_i is a vector of socioeconomic characteristics of origin zone i (such as income per capita).

Z_i is an index of the attractiveness of competing recreation sites relative to origin zone i (described below).

T_{ij} is the travel time from i to j.

Recreation visits would be expected to diminish with increasing distance from the origin zone to the recreation site, other things being equal. The travel distance function would be based in large part on the road distances separating origins and destinations, but the actual distances would need to be modified in accordance with the well-known fact that the marginal effect of distance on travel behavior decreases with increasing distance. In other words, whereas travel frequency is inversely-related to the distance (measured in cost, time, or other units) separating an origin from a destination, the relationship generally follows an exponential decay rather than a linear function.

Site attributes are likely to affect the popularity of a recreation site: greater beach frontage, for example, should attract more visitors to a recreation site, holding other factors constant. The site attribute vector could include an aesthetic index or other variables that varied according to the form and level of OCS development. It is in this variable that the link between OCS development and recreation patterns can be made.

Some studies have found that socioeconomic characteristics of the origin zone affect the volume of visits from that zone; for instance, higher income zones may generate more trips for marine fishing. The 1980 California Department of Parks and Recreation data cited above shows activity participation as a function of age, sex, race, income and origin zone.

Competing sites will influence the number of trips to a given site from a specified origin area. Several ways of measuring the attractive power of competing sites have been used:

- The travel cost of each competing site was used by Moncur (1975) in his study of the recreation of Hawaii beaches; this method allows one to identify substitute sites and complementary sites.

- An attractiveness index for competing sites has been widely used (see, for example, Coughlin, Berry, and Cohen, 1978). This index describes the attributes and accessibility of all sites k, except the site of interest, j, with respect to origin zone i. One form of the index could be $Z_i = {}_k(A_k/C_{ik})$, $k \neq j$.

The issue of including travel time and on-site time in the model has received much attention. Smith, Desvousges, and McGivney (1983) concluded that "theoretical analysis implies that the definition of the nature of the relationship between an individual's time constraints plays a central role in the determination of the individual's corresponding opportunity cost of travel time" (p.276).

Travel time may be either of utility or of disutility to the recreationist. That is, the time spent in getting to the site may be viewed as a cost or it may be viewed as part of the benefits of the recreation trip (Cheshire and Stabler, 1976). On-site time may be viewed similarly (Smith, Desvousges, and McGivney, 1983). The practical impact of incorporating travel time is that the estimate of the effect of travel costs on visits can be greatly altered. Travel cost and travel time are highly correlated and by omitting travel time from the model, the estimate of the effect of travel cost on visits can be biased (Allen, Stevens, and Barrett, 1981).

In applying gravity-type models it is necessary to make practical choices about functional form and definitions of the origin zones. Different functional forms have been shown to result in quite different estimates of number of visitors, especially at the extreme values of distance (visitors from very close or very distant origin zones). Studies by Flegg (1976), Sutherland, (1982a) and Coughlin, Berry and Cohen (1978) among others, present a comparison of findings from different functional specifications. Flegg compares models in which all variables are expressed in logarithms, in which only visits are expressed in logarithms and the explanatory variables are not, and in which the dependent variable is expressed as a rate, visits per person. Coughlin, Berry, and Cohen compared five basic functional forms plus others. In general, there is no one best functional form based on goodness of fit and behavior at extreme values.

The definition of origin zones can greatly affect the estimate of number of visits as well. Flegg confirmed what is well-known — that aggregation of origin zones into just a few zones improves goodness of fit as measured by R^2. More importantly, he showed that the estimate of the effect of travel costs on visits is highly sensitive to aggregation. In particular aggregation of zones introduces large biases in the coefficient of the cost variable.

Another problem arises in connection with origin zones. Many beach-goers live very close to the beach and indeed most users of some beaches may come from close by. If the data base uses large origin areas, it is likely that all or nearly all users of some beaches will come from only one origin area, thereby making it difficult to calibrate the gravity model.

Studies which use individuals as units of observation are an important part of the literature. Gum and Martin (1975) estimated models of the form:

$$Q_{ijh} = f(X_{ijkh})$$

where

Q_{ijh} = the number of household trips for activity i to site j by household h

X_{ijkh} = the value of the independent variable k for household h for activity i at site j.

The independent variables in their study include travel costs, travel costs for substitute activities, age of the recreationist, vacation days of the recreationist, education of the recreationist, and income of the recreationist. McConnell and Strand (1981) estimated the annual number of sportfishing trips per angler in Chesapeake Bay as a function of travel cost, dollar value of travel time, and length of the angler's boat. The same issues as those pertaining to the zone model above apply here and the model can be used in economic valuation of recreation sites in the same way as the zone model described above. Thus, it is not necessary to detail the characteristics of household models in a separate discussion.

2. Trip Distribution Models

The gravity models described in the previous sections represent a family of model types. Gravity models, for example, may be constrained as to the total number of trips in the system, the outflow totals from each origin, the inflow totals to each destination, or both inflows and outflows (Haynes, 1984). In this section we will discuss those with constrained outflow totals or both outflow and inflow totals. In this report we refer to them as trip distribution models.

One kind of trip distribution model is the production constrained model, where only outflows are constrained. Baxter and Ewing (1979) present the model as:

$$\text{Log}\ \frac{P_{ij}}{P_{ik}} = \log\ A_j - \log\ A_k - c\ \log\ \frac{D_{ij}}{D_{ik}} - a\ (D_{ij}^b - D_{ik}^b)$$

where

P_{ij} = the observed probability of travelling to destination j <u>given that the trip originates at i</u>

P_{ik} = the observed probability of travelling to destination k, i.e. all destinations other than j

A_j = the attractiveness of destination j

A_k = the attractiveness of destination k, i.e. all destinations other than j

D_{ij} = a measure of distance from i to j

D_{ik} = a measure of distance from i to k

Usually, the parameters are set at one of the following values: a = 0 (power function), or c = 0 and b = 1 (exponential function), or b = 1 (Tanner's function). The remaining parameters are then estimated using least squares or other techniques. Note that A_j is determined as the constant in a regression model; it is not an observed variable as in the gravity-type models. Note also that P_{ij} is conditional on the trip originating at i.

Baxter and Ewing examined the effects of different functional forms on the estimates of the parameters using origin-destination data for visits to state parks in northeastern Pennsylvania in 1967. These data were first analyzed by Frank Cesario. The authors concluded that the specification of the distance function did not materially affect the value the function took on and that different specifications resulted in similar values of A_j. Moreover all the models performed poorly. The model was improved slightly by considering intervening opportunities.

Another kind of trip distribution model is the doubly constrained model. Leonardi (1981) sets out the general form as:

$$T_{ij} = u_i v_j f_{ij}$$

$$\sum_j T_{ij} = G_i$$

$$\sum_i T_{ij} = A_j$$

where

T_{ij} = the number of trips from origin i to destination j

G_i = the total number of trips generated from i

A_j = the total number of trips attracted to j

f_{ij} = a measure of impedance to travel from i to j, expressed as a function of travel cost C_{ij}

u_i, v_i = balancing factors of biproportionality.

There are several generally used forms of f_{ij}, e.g.,

$$f_{ij} = aC_{ij}^{b}e^{-cC_{ij}}.$$

To put the doubly constrained model into operational form, we can represent spatial interaction in a production-constrained form or an attraction-constrained form (Leonardi, 1981). For example, the production-constrained form is obtained by dividing both sides of the equation,

$T_{ij} = u_i v_j f_{ij}$ by G_1 to obtain $T_{ij} = \dfrac{G_i v_j f_{ij}}{\sum_j v_j f_{ij}}$

Sutherland (1982b) developed a doubly constrained trip distribution model for recreation activity in the Pacific Northwest. This model consists of three elements: a trip production model which estimates the proportion of the population in each zone who participate in a given recreation activity and the number of days they participate; a trip attractions model which estimates the number of visitor days at each recreation site or group of sites; and the relative frequency distributions of recreationists' trips by distance. Thus, he had three types of information -- the number of participants from each residential zone, the number of participants at each recreation site, and a distance decay pattern to distribute recreationists from origins to destinations. Data available in California are similar but more limited. The California Department of Parks and Recreation has survey data on recreation trips from origin zones, on distance travelled and on attendance at state parks, but not at city and county parks.

Sutherland's model is of the form:

$$T_{ij} = P_i \frac{A_j F_{ij}}{\sum_j A_j F_{ij}}$$

subject to: $\sum_j T_{ij} = P_i$

$$\sum_{ik} T_{ijk} = \sum_k A_{jk}$$

where

- i = origin i
- j = destination j
- k = planning region k
- T_{ij} = the number of recreation days produced at i and attracted to j
- P_i = the number of recreation days produced at i
- A_j = the number of recreation days attracted to j
- F_{ij} = a function of distance from i to j.

Sutherland used an iterative technique for reconciling his data to the constraints and to the gravity model specification. This is described in his 1983 report. Sen and Soot (1981) describe a general iterative proportional fitting procedure which alternately scales origin and destination totals. This procedure is of the form:

$$T_{ij}^{(2r)} = T_{ij}^{(2r-1)} P_i / T_{i+}^{(2r-1)}$$

$$T_{ij}^{(2r+1)} = T_{ij}^{(2r)} A_j / T_{+j}^{(2r)}$$

The subscript + indicates summation and r indicates the iterative round.

A variety of methods have been devised to calibrate trip distribution models (Willekens, 1983). Least squares (regression) procedures and maximum likelihood estimates have been used for the distance decay function. Batty and Mackie (1972) describe calibration procedures.

3. Attribute Models

Occasionally, analysts model the level of recreation activity as a function of recreation site attributes only, omitting other explanatory variables such as accessibility of the recreation site. Thus, these models are similar to gravity-type models, but they do not contain any variables reflecting the population living in the market area of the recreation site or the distance of that population from the site.

The Granville Corporation (1981) used such a model to explain beach attendance at various California beaches. The original specification of the model included an accessibility measure based on population and distance, but this variable was deleted from the model since it was not statistically significant. The variables which remained in the model were: a rating of aesthetic features which would not be affected by OCS development, waterfront in wetlands, distance from parking area to the beach, acreage for day use activities, a dummy variable indicating the presence or absence of nearby commercial establishments, and several variables reflecting the aesthetic rating of the beach for features which could be affected by OCS development. This study is of particular interest because it compiled a data base on the aesthetic characteristics of California beaches and because it allows the analyst to estimate the impact on attendance of changes in aesthetic characteristics of the beach due to OCS development. The method could easily be folded into a gravity-type model.

4. Time Series

Time series methods are based on a series of data over several years for one or more recreation sites. The object is to forecast future trends or explain past trends in recreation activity as a function of exogenous variables, possibly including time as an index of general direction of change. In the case of the impacts of OCS development on recreation, it is necessary to include as an exogenous variable at least one measure of the degree of presence of OCS development.

Stynes, Bevins, and Brown (1980) discuss the general time series of trend models. One type is trend extension, a method which can work well only if the underlying forces producing a given trend do not change significantly. This type of model would be inappropriate in the case of a major change in recreation site attributes such as an oil spill or major aesthetic impacts from oil and gas platforms. Trend extensions also require that a particular functional form be chosen and this may introduce large errors in forecasting. For example, exponential, linear, logistic, or cyclical models may all fit the historical trend but they result in vastly different forecasts.

A second type of time series model is a structural forecasting model. Recreation activity is modelled as a function of population characteristics, recreation opportunities, and recreation site attributes. To forecast recreation it is, of course, necessary to forecast the underlying explanatory variables, i.e. population characteristics, recreation opportunities, and site attributes. Changes in site attributes may be regarded as scenarios, such as installing offshore oil platforms, or occurrence of an oil spill. Among the difficulties with structural forecasting models, according to Stynes, Bevins, and Brown, are: difficulties in forecasting the exogenous variables, selecting the most appropriate functional specification, failure to include substitution effects among recreation sites, difficulty in incorporating recreation opportunities unless cross sectional data are also used, inability to obtain data on critical explanatory variables, and reliance on statistical explanation rather than economic or other social science explanation of trends.

The studies undertaken to establish the impacts of oil spills near Santa Barbara, Brittany, and Nantucket all used a time series approach, at least in part (see Section B.1 above). Time series of tourist expenditures or attendance at recreation sites were analyzed before, during, and after the oil spill to estimate the effect of the oil spill on recreation or expenditures.

In drawing inferences from times series data, it is important to identify all the major causes of changes in expenditures or attendance. Otherwise the impact of OCS development could be mis-estimated. The authors of the reports cited in Section B.1 interviewed knowledgeable individuals to help interpret their results; for example, changes in beach characteristics (other than oil spills), entrance fees, or other recreational attractions may affect the time series.

To identify long run time trends, seasonal variations, and impacts of oil spills on wage payments in tourist industries in Brittany (with respect to the Amoco Cadiz spill), Grigalunas et al. (1983) used regression analyses on time series data. In one model, their independent variables included deviation of mean temperature in the third quarter of the year from the 30 year average, deviation of the mean precipitation in the third quarter of the year from the 30 year average, an index of years (1 to 18), population in the department, per capita income, and a dummy variable for 1978, the year of the oil spill. The temperature and rainfall variables are intended to identify effects of unusually good or poor weather for recreation. The time period covered the years from 1962 to 1979. In general, there was a downward trend in wages paid in the tourist industries (holding constant the effects of population change and rising income) which was, for some tourist industries, amplified by the 1978 oil spill. Thus, the oil spill caused a discontinuity in the time trend in wages paid in some tourist industries in Brittany.

The Granville Corporation (1981) used time series analysis to explain past beach usage, number of registered boats, and sportfishing for the California coast. These analyses were also used to make forecasts of future coastal recreation. In the case of beach usage, a separate regression equation was estimated for each of several coastal segments. Attendance at state beaches and nonstate beaches was regressed against local population, regional population, market area per capita income, the consumer price index for gasoline, and a time trend variable (1964 = 1, 1965 = 2, etc.). Because of the short time series of data available, high values of R^2 (goodness of fit) were usually obtained, even if the coefficients of the independent variables are not statistically significant. A similar approach was used for estimating the number of registered boats by county. For sportfishing, a regression model for the entire state was estimated, using as independent variables state population, state per capita income, the consumer price index for gasoline, and a time trend.

Although recreation time series data is available for state parks in California, this approach was not felt to be well suited to the purpose of this analysis. The aesthetic effects of OCS development on recreation attendance are thought to be relatively small, and very difficult to separate from other, more significant changes occurring over time. Changes in variables such as new roads, traffic congestion, beach crowding, support facilities, parking and nearby population could all swamp the effects caused by OCS development.

5. Participation Models

Participation models are those which predict the number of people who will participate in a given activity based on the characteristics of the individuals. The unit of observation is the individual or household. The model does not predict where the recreationist will go, but only whether he or she will participate and how often. Thus, for the purposes of this project, participation models would have to be used in conjunction with other models which predict where people will go as well.

Sutherland (1982b) used a trip production model that estimated, first, the probability of an individual participating in a given activity (swimming, camping, fishing, boating), and then, the frequency of participation of those who participate. He modelled the probability of participating and the frequency of participating as functions of individuals' age, sex, and income, and an index of accessibility of all recreation sites to the respondent. For participation, age, sex, and income were generally important explanatory factors; recreation accessibility was important only for swimming; and goodness of fit was only fair (R^2 less than .26). For frequency of participation, the goodness of fit was low (less than .09), as is typically found.

Scardino et al. (1970) used participation equations in their model of recreation in the Northeast. Participation and frequency equations for swimming in salt water during the summer are a good example of their method. The probability of salt water swimming (in the participation equation) was modelled as a function or respondent age, household income, education, number of children under six, and an index of the availability of recreation sites. Goodness of fit was acceptably high (R^2 = .25) for this kind of model. The frequency of day trip participation in salt water swimming was modelled as a function of availability of recreation sites, and the probability of participating in salt water swimming. Goodness of fit was again high for this type of problem, R^2 = .28.

These kinds of participation and frequency models require a large survey to provide the data base. The Recreation Travel Patterns Survey cited in Section C.1 was considered for use with this method; and such a participation model would fit well with a trip distribution model.

6. Expert Opinion

Predicting the impacts of coastal energy development on recreation can be difficult when there are few data points to rely on, especially if the area of interest has had little history of coastal energy development. Facing this problem for the New Jersey shore, Rogers, Golden, and Halpern (1984) used expert opinion to estimate the impacts of various scenarios on coastal recreation.

The experts included fifteen people knowledgeable about the New Jersey shore: a realtor, a restaurant owner, an electrical utility official, a professor specializing in tourism, planners, and other local officials. A Delphi technique was used to estimate the percentage of tourists diverted by various energy related situations. Among the findings were:

- for a change in visual quality due to two 400 foot smokestacks, six percent of visitors to seasonal homes would be diverted elsewhere;
- for a 10,000 barrel oil spill covering 2,500 acres of water, 35 percent of the visitors to seasonal homes would be diverted elsewhere.

The expert opinion method is specific to the scenario hypothesized and cannot easily be expanded to encompass a variety of development forms and sizes in different settings.

This kind of approach can be useful when other sources of data are lacking but because it is hypothetical, it should be checked against independent estimates if possible. These independent estimates could come from analysis of time trends or cross sectional patterns of similar areas under similar conditions. Expert opinion could also be used to check the results of a time series or gravity type model.

D. Estimating Demand Schedules for Recreational Activity

Economists measure the value of a good or service using the demand schedule for that good or service. The demand schedule is a functional relationship between the quantity of the good or service consumed and the price of that good or service. The higher the price, the less is consumed, ceteris paribus. Figure 3-2 illustrates a downward sloping demand curve (D) for outdoor recreation at a coastal site. An oil spill would cause the demand curve for recreation at this site to shift to the left. Similarly, the aesthetic effects of OCS development may cause the curve to shift to the left. The shift would occur because the oil spill or visual effect would lower the utility of the affected site, thus decreasing both the number of visitors and the value placed on the site by the remaining visitors. Thus, at any price, the quantity of recreation demanded would be less because of OCS development.

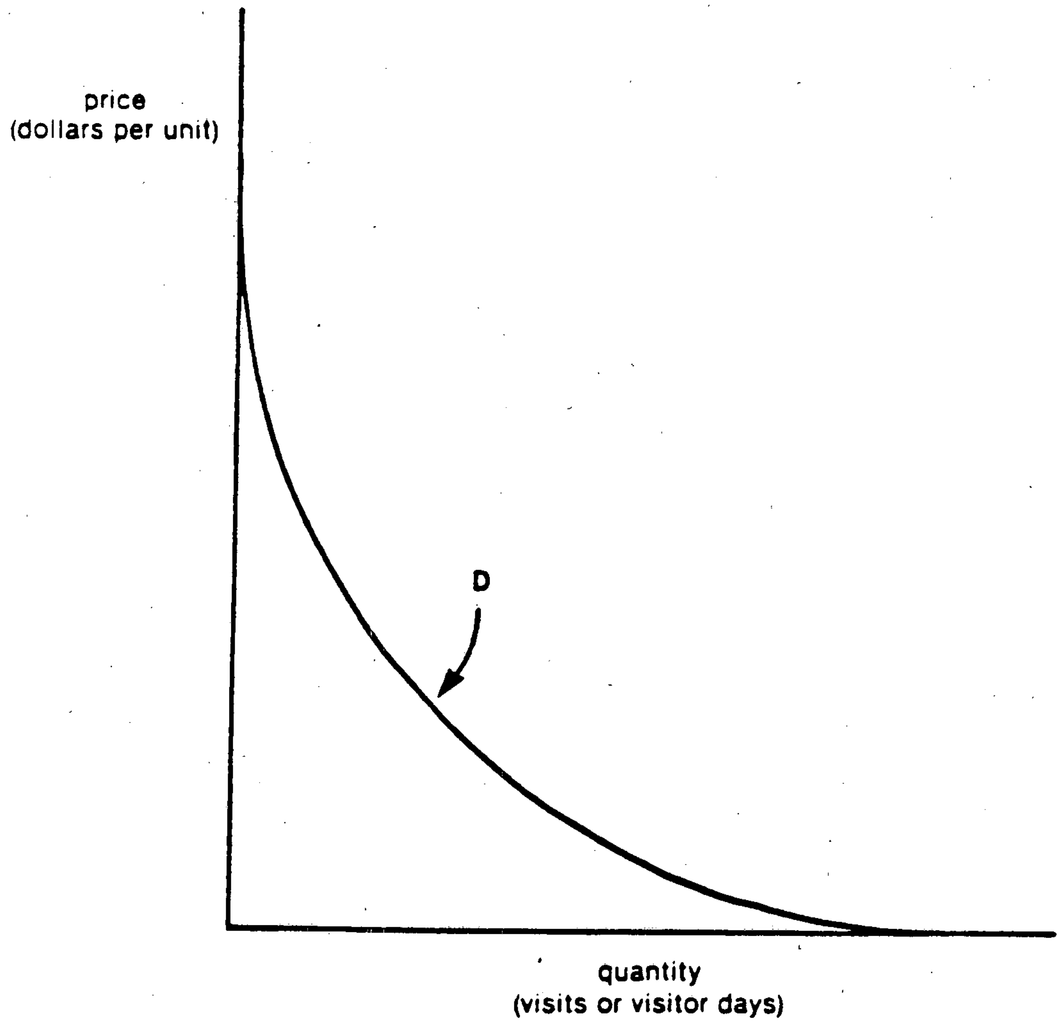
There is typically no market for beach recreation or many other kinds of coastal recreation. If there is any charge at all it may be nominal such as a park entrance fee. There are, however, costs associated with travel to the site. Some types of recreation, such as marine fishing on rented boats, may be marketed.

The economic value of coastal recreation is measured by the area under the demand curve above the market price for the activity at the site. For a site with no entrance fee, the economic value is measured as the area under the entire demand curve. This area represents consumer surplus, the excess of willingness to pay which consumers would have paid but did not have to, thereby keeping the extra dollars for themselves.

To measure the economic value of the impact of OCS development, it is necessary to estimate the demand schedules for each type of recreation activity at each site with and without that development. Both aesthetic impacts and oil spills must be considered.

Figure 3-2

Demand for Recreation at a Particular Site



There are several methods for estimating the demand schedule for outdoor recreation. For marketed recreational services such as rental of fishing boats and equipment, it may be possible to observe points on the demand curve as it shifts over time and to observe points on the supply curves as the supply of rental boats and equipment changes over time. An econometric model would be needed to perform the analysis.

For nonmarketed recreation sites, there are two widely used methods for estimating demand schedules. One is the travel cost method in which recreationists' reactions to travel costs are used to infer a demand schedule for the recreation site. The second is a contingent valuation method in which people are asked how many trips they would make to the recreation site at various prices under OCS development conditions, including oil spills. Each of these two methods is described below. In addition, several other less widely used methods are also discussed.

It should be appreciated that the economic perspective cannot claim to measure all aspects of value of a recreation site. People may not be able to trade off money and site characteristics, especially as aesthetic, ecological, and other less tangible values of a site are considered. In addition, as we shall see below, some of the fundamental assumptions of preference functions are often violated even in rather simple trade-off problems. Thus, economics cannot provide a representation of the entire value of recreation sites with or without OCS development.

1. The Travel Cost Method

This method assumes that travel costs are fungible with entrance fees to the recreation site and that more of one is exactly offset by less of the other. A two stage analysis is used. In the first stage, the propensity to visit a recreation site is estimated as a function of travel cost and other variables. For this discussion, assume that propensity to visit the recreation site is expressed in visits per thousand population living in the origin zone. Assume there are four origin zones with travel costs, populations, and visits as shown below. Propensity to visit is graphed against travel cost in Figure 3-3.

Illustrative Data for Travel Cost Method: Stage 1

Origin Area	Travel Cost	Population	Visits per thousand population	Total visits
A	$ 5	1,000	640	640
B	$15	5,000	320	1,600
C	$10	1,000	480	480
D	$20	15,000	160	2,400
TOTAL				5,120

In the second stage, the demand for recreation at the site at each price (current price, current price + $1, current price + $2, etc.) is estimated by adding a hypothetical entrance fee to travel cost and re-estimating visits based on the propensity to visit as shown in Figure 3-3. Examples are shown in Table 3-2.

Figure 3-3
Propensity to Visit Recreation Site

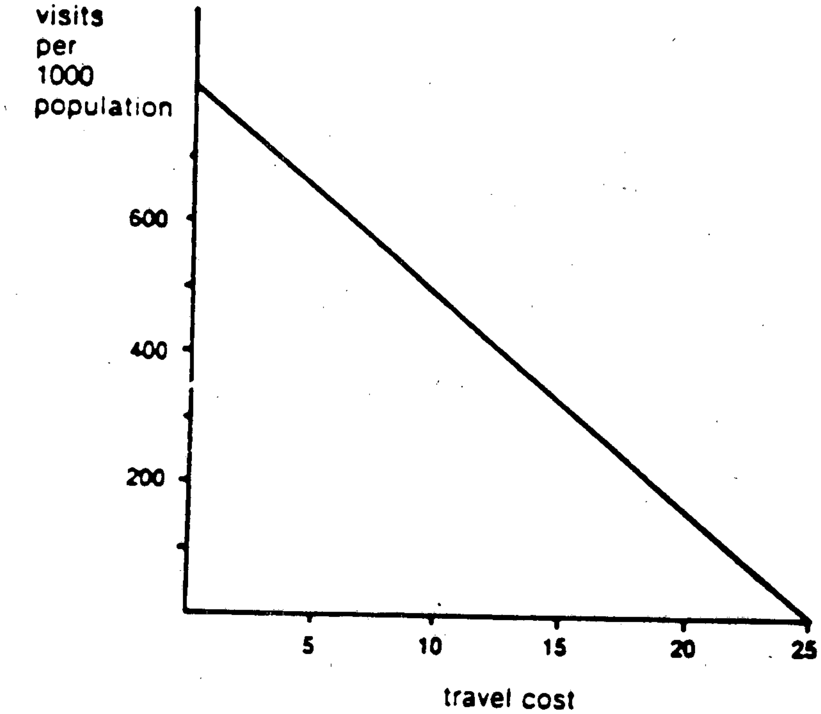


Figure 3-4
Demand for Recreation at the Site

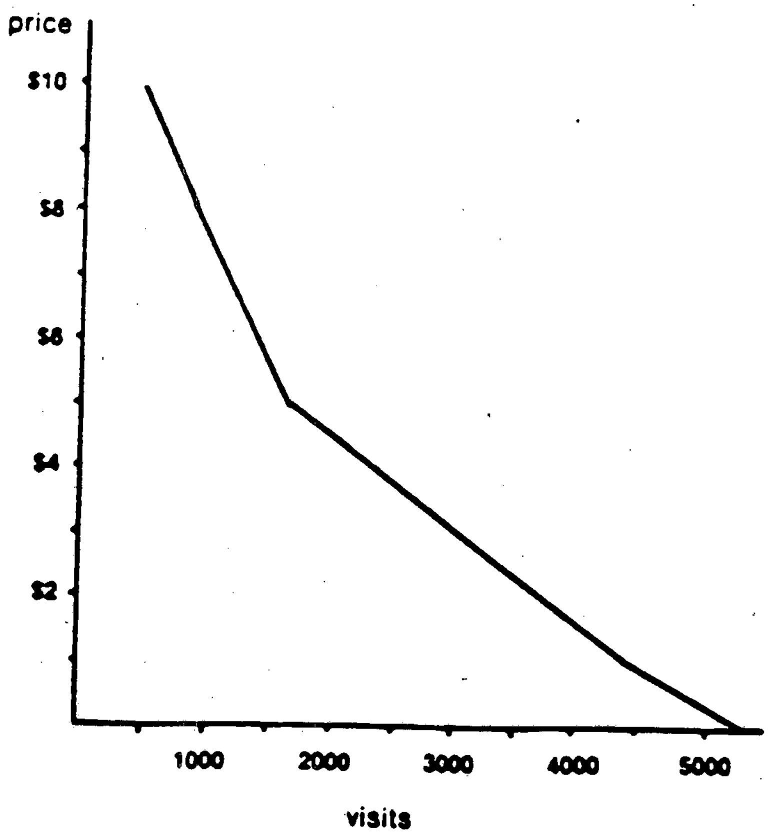


Table 3-2
Origin Area and Total Visits at Current Travel Cost Plus Additional Fee

Current Travel Cost	Fee = $1	Fee = $2	Fee = $5	Fee = $10
A ($5)	608	576	480	320
B ($15)	1 440	1,280	800	0.
C ($10)	448	416	320	160
D ($20)	1,920	1,440	0	0
TOTAL	4,416	3,712	1,600	480

If the fee is $1, we read the graph in Figure 3-3 at a travel cost equal to the current travel cost plus $1 (e.g. $6 for origin area A). If the fee is $5, we read the graph at a travel cost equal to the current travel cost plus $5 (e.g. $20 for origin area B). Since Figure 3-3 shows visits per thousand population, the reading for origin area B must be multiplied by 5 and that for area D by 15. This calculation completes the second stage.

The total number of visits is plotted against the hypothetical entrance fee in Figure 3-4. This is the demand for recreation at the site of interest. The area under this curve is the consumer surplus associated with the site.

The travel cost method typically begins with a destination-distance survey or a gravity-type model to estimate the propensity to visit recreation sites. These models were discussed above. The second stage, in which the demand curves for the sites are estimated, is derived from the destination-distance surveys in the manner just explained.

Most of the studies described in connection with the gravity-type models also derive estimates of the demand for the recreation sites of interest (Allen, Stevens, and Barrett, 1981; Sutherland, 1982b; Gum and Martin, 1975; Flegg, 1976; and Moncur, 1975; for example). The difficulties in selecting a functional form, in aggregating origin zones, and in omitting variables such as travel time, which are inherent in gravity-type models, show up in the estimation of consumer surplus in stage 2. Thus biases introduced in the first step influence the results of the second step.

As examples of the biases, Sutherland (1982a) reported an average consumer surplus for boating at selected Washington sites at $4.24 per visitor day using a semilog gravity type model (the logarithm is taken of the dependent variable) and $9.23 using a log-log functional form (where the logarithm of each variable is taken). The discrepancy in his example of aggregated and disaggregated origin zones (using a semilog functional form) was not as great, the average consumer surplus being $5.50 per visit using smaller zones, and $5.93 per visit using aggregated zones. Ziemer, Musser, and Hill (1980) performed a similar analysis to identify the errors in consumer surplus introduced by different functional forms in stage 1.

The travel cost method may not be appropriate for some California beach recreation. In some cases most recreationists live within a few blocks of the beach, thereby incurring no significant out-of-pocket expenses in getting to the beach. In such a case, the travel cost method would fail to work; one of the methods described below would have to be used.

To illustrate the application of the travel cost method we consider two studies not cited above. Bouwes and Schneider (1979) examined the consumer surplus of recreation at eight southeastern Wisconsin lakes as a function of water quality. The first step regression equation is:

$$V = 43.22 - .317C + .008C^2 - 5.264\ln R - .162T + .0003T^2 - .321I,$$
$$R^2 = .203, n = 195$$

where

V = visits per year for individuals in the sample
C = total variable cost per trip
R = the recreationist's rating of water quality (lower values represent higher water quality)
T = round trip time
I = the recreationist's annual income

The number of visits at various entrance fees is determined by substituting incrementally higher costs into the equation and solving for V. This yields the second stage demand curve. For current water quality conditions the authors estimated consumer surplus to be $429,000 per year.

McConnell (1979) analyzed marine recreational fishing using data from Rhode Island. In the first step, he estimated the following regression equation:

$$x_i = 7.1 - .085t_i + .015q_i + .012E_i, \; R^2 = .11, n = 56$$

where

x_i = number of fishing trips by individual i
t_i = the cost of taking another trip
q_i = the catch per trip
E_i = the experience of the angler in number of years fished

Consumer surplus per angler in step two was estimated at $233 at the mean values of the independent variables.

2. Hedonic Travel Cost Method

In the hedonic travel cost method each recreation site is viewed as a bundle of characteristics. These characteristics are objective qualities of the site such as beachfront footage, number of picnic sites, number of visible oil rigs, and total acres. This approach tries to measure the relative contribution of each attribute to the price of a visit. The cost of the trip to the site is the measure of the price of the visit. By examining the choices of recreationist and travel costs from each origin, the "price" of each characteristic can be estimated. The demand for a characteristic can then be estimated by observing how much of the characteristic is purchased by recreationists facing different prices. The shape of the estimated demand curve, in turn, is used to estimate the change in consumer surplus for any change in a characteristic.

The disadvantage of the approach is that it requires a substantial amount of data. Detailed data on site characteristics are required, because every site characteristic of importance needs to be included in the analysis. In addition, this method requires origin-destination histories of recreationists. It is not sufficient to only know how many trips are generated from an origin, the site destination of each trip must also be known. Data available for California recreation trips do not show specific destinations. The hedonic travel cost method, therefore, was not feasible for use in this study.

3. The Contingent Valuation Method

The travel cost method presents several difficulties which can lead to large errors in the estimation of the consumer surplus for a recreation site: an untested assumption about the fungibility of travel costs and entrance fees, biases resulting from omitted variables in the first (gravity-type model) stage, biases resulting from aggregation of origin zones, and biases resulting from specification of the functional form of the first stage gravity-type model. In addition, it is not applicable to cases where the recreationist bears little or no travel cost in getting to the site. An alternative approach to putting an economic value on an unmarketed good (a recreation site) is to ask people their willingness to pay for that good contingent upon formation of a market for the good. This approach, sometimes called the contingent valuation method, has received considerable attention in the last ten years in evaluating environmental goods and services.

The basic idea is to structure a set of willingness to pay questions for a sample of respondents for different levels of quality or quantity of the nonmarket good. For instance, people may be asked in a survey how many times they would visit a beach if the entrance fee were $x, $x+1, $x+2, etc. They would be asked these questions for the beach at various quality levels: e.g. clean beach with unobstructed ocean view, clean beach with one oil platform four miles out; clean beach with several oil platforms four miles out; beach with slight oil spill damage, beach with severe oil spill damage, etc. From the responses, it would be possible to construct the demand for the recreation site under different OCS development scenarios and compare the consumer surplus of each.

An early attempt at such a willingness to pay study was Mead and Sorensen's (1970) survey about the value of the beaches near Santa Barbara relative to the value of a movie. This was described in Section B.1 above. Since then, bidding game methods and more rigorous structuring of the questions have improved the methodology. However, a number of problems remain:

- Questions pertain to hypothetical situations, and in most questionnaires people do not actually have to pay any money. Thus, their answers might be unrealistic. A well-known experiment comparing hypothetical willingness to pay, hypothetical willingness to sell, actual acceptances of money for relinquishing recreational access, and the travel cost method showed widely different values of consumer surplus (Bishop, Heberlein, and Kealy, 1983).

- Willingness to pay and willingness to sell are not similar in value in contrast to results predicted by economic theory. Empirically speaking, movements along indifference curves are not reversible in contradiction to the theory of the consumer. Knetsch and Sinden (1984) compared actual responses to willingness to pay and willingness to sell situations and concluded that there could be an "ambiguity in the assessment of losses and in judging the desirability of changes in policies of resource allocations. The benefits of a proposal might exceed the costs if measured on one basis and fall short if measured on the other." (p. 519). This calls "for more caution in measuring all manner of economic losses, closer examination of legal rules regarding damages and assignments of entitlements and possibly some thought to revision of normal presumptions of behavior used in a good bit of economic analysis" (p. 518).

- There may be biases built into the form of the questions asked of respondents or in the information provided to the respondents (Rowe and Chestnut, 1983). These sources of bias must be assessed perhaps by asking subsamples of respondents different sets of questions or by providing different amounts of information to subsamples of respondents.

4. Unit Day Value Method

The U.S. Water Resources Council (1983) published guidelines for evaluating water-related recreation when the travel cost method and contingent value method are neither feasible nor justified for the project under study. These values are obtained by the unit day value method. The unit day value method begins by characterizing the recreation activity and site with respect to the number and quality of recreation activities at the site, the accessibility of the site, the carrying capacity of the site, the availability of alternative recreation opportunities (or likelihood of success at fishing or hunting), and the environmental quality at the site. Points are awarded to each of these valued components according to a table of scores. There is a separate table for general recreation and for special recreation which pertains to unusual activities, where intensity of use is low, and specialized skill is required. Given the point values, one then uses a table which converts points to dollar values of consumer surplus per recreation day.

The analyst is cautioned by the Water Resources Council to compare the results with studies using the travel cost method and the contingent value method as a check. He is also advised to seek public involvement to verify his selection of points and conversion of dollars to points.

As an example of the method, consider the following application of the method and the Council's point score tables for a beach without any OCS development offshore:

- recreation experience: two general activities, swimming, sunbathing — 2 points;
- availability of opportunity: several other beaches within 1 hour travel time but none within 30 minutes travel time — 5 points;
- carrying capacity: adequate facilities — 7 points;
- accessibility: good roads to site, good roads within site -- 12 points; and
- environmental quality: high aesthetic quality, no factors exist to lower quality — 13 points.

Total points are 39. This translates to about $3.00 of consumer surplus per recreation day (in 1982 dollars).

If OCS development occurred, environmental quality might be the factor most affected. It might, for instance, lower the aesthetic quality and if the points for this factor were reduced to 1, the total points would thus drop to 27. This converts to about $2.30 of consumer surplus per recreation day (in 1982 dollars), for a reduction of $.70 per recreation day (in 1982 dollars).

Thus, the unit day value method could be useful in assessing the impacts of OCS oil and gas development on recreation in coastal California. However, the method requires important judgment calls by the analyst in selecting the points. In addition, it is necessary to check the resulting dollar values against travel cost or contingent market method results. As Dwyer, Kelly, and Bowes (1977) noted in their criticism of an earlier version of the unit day value method, there is no theoretical or empirical basis for the conversion of points to dollars. In addition, there is no basis for the relative weighting of the various recreation points factors -- e.g., should environmental quality be weighted more than accessibility, less, or the same?

In conclusion, the unit day value approach could be used as a last resort for measuring consumer surplus. If used, its application would have to be supported by other data and by a careful explanation of how points were determined.

5. Land Value Method

Diminution of the aesthetic values of an ocean view or oil spills can be expected to affect the market value of beach front property. Mead and Sorensen (1970) estimated that the Santa Barbara oil spill affected about 250 beach front properties, lowering values by about 20 percent in 1969. However, they argued that this decline in values was temporary and it would fade away in about five years because the oil spill was cleaned up.

More generally, the benefits of access to an amenity such as ocean views and beaches will be registered in the location rent of properties. Land closer to the ocean will command a higher price, if all other factors are held constant, because of the greater accessibility to these amenities. When the amenities are lowered in value, as could occur if oil platforms disrupt the view or if oil spills occur, the land market will register the decline in the value of accessibility.

While we and others have conducted studies of the effect on property values resulting from quality changes in urban lakes, the property value method would be difficult to apply in the case of OCS development (Dornbusch & Company, 1973, 1976). It is necessary to analyze sales transactions data and the method works best where there are many transactions, as in urban areas. Moreover, Dwyer, Kelly, and Bowes (1977) note that "in practice, the method can only be used for land in the immediate vicinity of a site. The expense of data collection and the multitude of factors which affect land values would make it difficult to estimate the effect of a site on land values at distant locations." (p. 182).

The land value technique has been applied to isolate property price changes caused by changes in environmental amenities, using a before-after cross-sectional approach. However, this method relies on a dispersion in the variable which expresses access to the environmental feature. Such a dispersion is not available in the case of OCS development occurring as much as three or more miles offshore.

E. Direct Impacts of Recreational Activity

The direct impacts of recreational activity are the expenditures by recreationists on recreation services, food, lodging, travel, and other items in the impact area or region of interest. Data pertinent to California coastal recreation on expenditures by category of purchase by location must be gathered from a variety of sources:

- Vars (1979) estimated expenditures by saltwater boaters in Oregon which could be used in a model of recreation expenditures in coastal California. The average annual boating expenses for saltwater boating were $927 in 1977; the median was $408. These expenditures are broken down by preseason expenses, various types of boating season expenses, and several types of out of season expenses. However, the expenditures would have to be allocated as occurring inside or outside the impact area if they are to be used to assess the impacts of coastal recreation in California.

- Using California statewide data on spending by tourists who travel round trip at least 200 miles, the Granville Corporation (1981) estimated that tourists pursuing outdoor recreation activities (and traveling at least 200 miles on round trips) paid the following in 1980 per capita:

Transportation	$31.18
Lodging	$ 7.84
Food	$16.42
Entertainment	$ 4.66
Incidentals	$ 4.72
TOTAL	$64.82

- The U.S. Fish and Wildlife Service conducts a study of expenditures by hunters and anglers every five years. The 1980 data are available and are published separately for California regions for saltwater fishing.

- The Regional Science Research Institute has prepared disaggregations of typical tourist expenditures into categories compatible with input-output models.

- In 1983, CIC Research compiled extensive information on the San Diego visitor in 1982, by:
  - Accomodation type
  - Transportation mode
  - Visitor residence
  - Purpose of visit
  - Visitor spending by type of accommodation
  - Visitor spending per day by category
  - Age of head of household in group visits
  - Income of visitor households

This study, however, contains no specific data on expenditures by activity.

- A survey-based study was conducted by Haug International, undertaken between January 1984 and April 1984. It was not a random sample, however. Questionnaires were left in "counter racks" at hotels, motels, restaurants, and other points of interest. The results may therefore be biased towards the overnight visitor. Specific data are available on expenditures by activity by type of accommodation:

- Lodging
- Restaurants (other than hotel dining)
- Grocery stores
- Sightseeing
- Shopping (gifts, clothing, etc.)
- Gasoline / car repair
- Cultural and special events
- Local public services (parking, busses, taxis, etc.)
- Recreation

This data can be very useful in establishing benchmark expenditure patterns. Also included is:

- Size of party
- Number of nights stayed by type of accomodation
- Reason for visit

o The Santa Barbara Conference and Visitors Bureau provides a breakdown of expenditures by category similar to above categories for the overnight visitor but only for 1982. This data provides total expenditures per person-day for day visitors and overnight stays in private homes. The method of compilation is unknown. The data includes monthly occupancy rates of Santa Barbara hotels and motels for the 1973-1983 period.

o The Santa Monica Convention and Visitor Bureau provides aggregate expenditures per visitor-day for the hotel/motel overnight visitor, home visitor, and day visitor. The data provides a breakdown by expenditure category for all visitors, and provides a percentage distribution of visitor activities:

- Go to beach	64%
- Sightseeing	53%
- Eating at restaurants	50%
- Shopping	36%
- Special events	6%

The data does not list coastal recreation-specific activity, however.

o The California Department of Economic and Business Development reports U.S. Travel Data Center-based data on people travelling over 200 miles round-trip for any purpose. The most useful data may be the percentage distribution of aggregate expenditures by expenditure category. This data may be biased to transportation costs.

o Sullivan ("Determining Changes in Final Demand for IMPLAN Economic Impact Analysis,") estimated expenditures by type of expenditure for selected types of recreational activity undertaken in the White River National Forest, Colorado, using market prices for a typical "shopping" basket of goods and services needed to participate in fishing and camping, as well as other activities not germane to coastal recreation activities (big-game hunting and downhill skiing, for example).

Table 3-3 summarizes some of the data sets described above.

The application of these kinds of data to changes in the volume of recreation activity would proceed as follows:

Table 3-3
Percentage Distribution Among Expenditure Categories and Per Person-Day Expenditure By Type of Accommodation, Current Dollars[1]

	All Visitors to San Diego 1982(2)	All Visitors to Santa Barbara Winter 1983-84(3)	Overnight Visitors to Santa Barbara 1983(4)	All Visitors to Santa Monica 1983(5)	Travelers in California 1982(6)
Expenditure Category					
Transportation	8.7%	9%	10%	5%	49.7%
Lodging	26.6	45	30	12	14.1
Food Service	25.7	18	32	55	24.0
Entertainment	9.2	2	3	4	6.2
Misc.	29.8	26	25	24	6.0
Average Expenditure					
Per visitor-day	$37.00	$74.51	$36.23	$31.54	
Hotel/motel	35.00	85.51	91.87	52.00	
Home Visitor	18.00	56.53	42.00	32.40	(NA)
Day Visitor	17.00	16.82	12.00	21.30	
Local	NA	NA	NA	NA	
Camper	21.00	67.67	NA	NA	

(1) Expenditure categories adopted from U.S. Travel Data Center definitions.

Sources:

(2) CIC Research, 1983. "Visitor Profile: Highlights on Visitors to San Diego, Annual Report - 1982," prepared for San Diego Convention and Visitors Bureau, January 1983.

(3) Haug International, 1984. "The 1984 Visitor to Santa Barbara - Vol. I," prepared for the Santa Barbara All-Year Association, May 1984.

(4) Santa Barbara Conference and Visitors Bureau, undated. "1982 Visitor Survey."

(5) Santa Monica Convention and Visitors Bureau, 1984. "Tourism is Everybody's Business."

(6) Calfironia Department of Economic and Business Development, 1984. "The Economic Impact of Travel in California - 1982," prepared by Office of Tourism, February 1984.

- estimate expenditures per visitor or per visitor day from these and other data sources;

- estimate the visitors or visitor days in the regions of interest with and without OCS development;

- allocate expenditures to those activities occurring inside the region of interest and those activities occurring outside the region of interest;

- multiply expenditures in each category of expenditure per visit or per visitor day by the number of visits or visitor days by the proportion of that class of expenditure occurring in the region of interest.

This yields the direct impact of OCS development in the region of interest.

F. Indirect Impacts of Recreational Expenditures

Changes in recreationists' expenditure patterns will have repercussions on the local economies of the California coast. If there is an absolute decline in coastal recreation as a result of OCS development, then sectors of the economy supporting recreation will also feel a decline in output, employment, and income generated. If OCS development causes coastal recreation to decline in some locations but increase in others, then there will be a shift in supporting activity, declining in some areas and increasing in others. These repercussions are the indirect impact of changes in recreation activity.

As noted in the previous section, recreationists' expenditures (the direct impact) consist of purchases from several sectors such as lodging, eating and drinking places, various retail sectors, recreation and amusements, and so on. In stating the direct impacts of these expenditures on a region in California, the expenditures would be disaggregated into a component of expenditures on goods and services purchased in the region and a component of expenditures on goods and services purchased outside the region. This will then be commensurate with the estimation of indirect impacts within the region.

Indirect impacts consist of purchases of inputs to meet the demands of recreationists. For example, to provide food and drink to recreationists, it is necessary to purchase various food ingredients, services and labor. The purchase of these food items in turn requires that other goods and services be produced. Workers receiving income from these activities spend money for consumer items and this generates additional production. This process is reiterated as each round of expenditures causes ever decreasing induced impacts in subsequent rounds.

The magnitude of the economic repercussions of recreationists' expenditures depends on the magnitude of the recreationists' expenditures (the direct impact) and the strength of the linkages between the recreation sectors and other sectors in the regional economy. The strength of these linkages depends on how much of which kinds of inputs are required to meet a dollar's worth of recreation demand and what portion of these inputs is produced within the region.

The economic repercussions are usually described as a multiplier effect. Multipliers may pertain to output, employment or income. Thus, an output multiplier of 1.5 for recreation expenditures in County X means that for every dollar of recreation expenditures in the County, there is generated $1.50 of output in total, $1.00 of that being the direct impact of recreation expenditures and $.50 of that being the indirect and induced impact.

In many instances, the most appropriate way to estimate the regional secondary impacts is by means of an input-output model. These models require data on intersectoral transactions among all sectors of the economy. When the economy is disaggregated into hundreds of sectors, the data requirements become too burdensome for the analyst to construct an input-output model from his or her own survey. Thus, nonsurvey input-output methods are used or an existing model for the region of interest is used.

As an example of the application of a nonsurvey input-output model, Gramman (1983) used a simple eleven sector model to derive multipliers for Shelby and Moultrie counties in Illinois in a study of the impacts of recreation expenditures at Lake Shelbyville. He found an income multiplier of 1.45.

Restrepo et al. (1982) used the Texas Input-Output Model to estimate multipliers for the Padre Island region for tourist activities. This model had already been prepared and could be used "off-the-shelf." Output multipliers were low, between 1.1 and 1.3, as is typically found for recreation activities in small open regions.

For the California coastal study, it is possible to use highly disaggregated "off-the-shelf" input-output models. These are nonsurvey models developed for general use. One is the Regional Science Research Institute (RSRI) model developed by Benjamin Stevens. A second is the RIMS II model developed at the Bureau of Economic Analysis (Cartwright, Beemiller, and Gustely, 1981). The third is IMPLAN developed by the U.S. Forest Service (Alward and Palmer, 1981).

The RSRI, RIMS II, and IMPLAN models assume the same technology in each region of the country. They start with the 1977 national input-output tables developed by the Bureau of Economic Analysis.[1] These are highly disaggregated tables employing about 500 sectors of the economy. The technical coefficients (representing dollar's worth of inputs from each sector per dollar's worth of output from each sector) reflect the national technology for production by each sector of the economy.

For regional analyses the models estimate the proportion of each input requirement that is produced within the region. Requirements produced outside the region do not have any significant effect on the regional economy so they are excluded from the analysis. Small regions such as counties are typically "leaky" so that most input requirements come from outside the region, resulting in small multiplier effects.

Nonsurvey models attempt to estimate the proportion of input requirements of each sector which are produced in the region of interest without conducting a survey of producers of goods and services within the region (Round, 1983). The way in which these proportions are estimated distinguishes the models.

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[1] IMPLAN is currently being updated from the 1972 national table to the 1977 table.

RIMS II uses location quotients to make the model region specific. Location quotients are calculated as follows: $LQ_i = \frac{X_{ir}}{X_r} / \frac{X_{in}}{X_n}$ where X indicates a measure of activity such as earnings generated by a sector in a given area or employment in a given sector in a given area. X_{ir} refers to sector i in region r, X_r refers to all sectors in region r, X_{in} refers to sector i in the nation, and X_n refers to all sectors in the nation. If the location quotient is less than one, it indicates that not all of the demand for output from sector i can be produced within the region and the proportion of output from sector i provided by region r is set to equal LQ_i. If LQ_i is greater than or equal to one it means that sector i is a net exporter from the region and that all the demand for output from sector i in the region could be met by regional suppliers; thus the proportion of output from sector i produced within the region is set at 1.0 or at some arbitrary value close to 1.0 such as .95.

There are several disadvantages of this method (Isserman, 1977 and 1980), of which the neglect of cross-hauling is probably the most significant. Cross-hauling refers to export of commodity A from a region and import of that commodity to the same region. More of the output of sector i is likely to be exported from the region than is indicated by the location quotient because of cross-hauling. Some is exported because not all goods or services produced by sector i are usable by sector j in the region. Suppose sector j requires a specific type of electronic equipment. Firms in the sector producing electronic equipment (sector i) might be located in the region but they could make a different kind of equipment than that required by sector j. Thus, the proportion of requirements from sector i produced within the region will be overestimated by using the location quotient because the sectoral disaggregation used is too gross. In addition, sometimes even identical goods may be cross-hauled because of traditional supply patterns and other reasons. Isserman found that location quotients consistently overestimate the proportion of goods and services provided locally and so multiplier effects based on location quotients will be too large.

IMPLAN (Alward and Palmer, 1981) estimates the proportion of goods and services provided locally by comparing the regional demand from each sector to the regional supply produced by each sector. Regional demand is determined by estimating the inputs required to produce the (known) output of each sector in the regional economy. This information is obtained by multiplying the national input-output technical coefficients (dollar's worth of inputs per dollar of output) for each sector by the regional output of each sector. If the total regional demand for each sector's output exceeds the regional supply or production, then the excess of regional demand over regional supply is met by imports. But if the total regional demand for each sector's output is less than regional supply or production, all supplies are assumed to be met locally. This procedure is an improvement over the location quotient method since it uses supply and demand estimates consistent with input-output technical requirements. However, it still overestimates the proportion of demand met locally since it ignores cross-hauling. Thus, it will overestimate regional multiplier effects.

The RSRI model attempts overcome the cross-hauling difficulty by using data from the Census of Transportation which indicates (for manufacturing sectors) how much of the output of each sector is exported from a region (and hence how much output produced in the region stays in the region). Unfortunately, the transportation data pertain to fairly large regions and errors are thereby introduced. Details on Stevens' methodology can be found in two papers — Stevens, Treyz, and Ehrlich (1979), and Stevens et al. (1983).

The extent to which the specific location quotient approach used in RIMS results in overestimation of multipliers appears to depend on the particular characteristics of the study region. Cartwright, Beemiller, and Gustely (1981) performed a series of accuracy checks on the RIMS method by comparing RIMS multiplier estimates to survey-based models for Texas, Washington, and West Virginia. While survey-based models may themselves contain errors, due to sampling problems or other causes, comparison of non-survey to survey techniques seems to be the most appropriate check on the accuracy of non-survey approaches.

While Cartwright, Beemiller, and Gustely (1981, pp. 39-57) tests focused on several measures of accuracy and dispersion, their general conclusion can be summarized briefly. Comparing the ratio of non-survey (RIMS) industry-specific column total multipliers to survey multipliers, the following results were obtained:

Ratios of mean column-total multipliers, RIMS (inversion) relative to survey:

Region	Total Output	Earnings or Value Added
Texas	1.055	0.995
Washington	1.030	0.925
West Virginia	1.092	1.097

Using 4-digit SIC payrolls data to estimate the location quotients, and calculating multipliers by inverting the regional I-O matrix, RIMS produced estimates of total output multipliers which averaged from 3.0 percent to 9.2 percent higher than the survey-based multipliers. When these same models were used to calculate earnings multipliers, the RIMS estimates average from 7.5 percent below to 9.7 percent above the survey multipliers.

If the survey-based method is in fact accurate, RIMS procedures overestimated output multipliers by 3.0 to 9.2 percent for these regions. No such overestimation is apparent for the earnings or value added multipliers derived from the RIMS approach. Cartwright, Beemiller, and Gustely also found that secondary-data approaches based on more aggregated location quotients tend to result in greater overestimation than those using disaggregated data.

In addition, it is not possible to predict the extent of overestimation for coastal California counties from these data, since they appear to vary by region. Moreover, cross-hauling may affect county-level estimates differently from state estimates. Cross-hauling may be more prevalent for a smaller economy than for a larger one, since a larger fraction of all sales and production is likely to occur outside the region. It would be possible to compare the RIMS results with other models estimated for the California coastal economies if both models were to cover the same time period. However, no survey-based I-O models for California counties were found, and other nonsurvey models are based on 1967 or 1972 national technical coefficients. RIMS is based on the 1977 national technical coefficients and is therefore not directly comparable.

As mentioned above, the IMPLAN approach is different from RIMS in several respects. First, while it starts with the 1972 I-O study, these technical coefficients are updated to 1977 using biproportional matrix adjustment techniques (see Alward and Palmer, updated). Second, final demands and value added are estimated for each study region, and this information is used to prepare a transactions table, rather than simply regionalizing coefficients. Third, IMPLAN uses a supply-demand pool technique to estimate regional export import flows as part of the regionalization process. Fourth, the data base used to regionalize IMPLAN is substantially larger and computations consequently more complex, than is the case with RIMS.

No published studies evaluating the accuracy of IMPLAN or comparing it to other approaches or survey models were available. While the IMPLAN approach appears to have a great deal of merit, the lack of evaluation was a cause for concern.

G. Conclusions and Method Selection

This section evaluates the methods for estimating the volume of recreation activity, for estimating the demand schedules for recreation resources, and for estimating the direct and indirect impacts of changes in recreational activity on California coastal communities resulting from OCS oil and gas development. The evaluation criteria are:

- data requirements of the method;
- reliability of the method;
- cost of implementing the method;
- ease of updating the model;
- geographic disaggregation which can be attained; and
- linkages to other methods.

Table 3-4 summarizes the major methods for assessing economic impacts of OCS oil and gas development on recreation in coastal California. Several minor methods are excluded from the table. The table is largely self-explanatory so the following discussion focuses only on the highlights.

1. Estimation of the Volume of Recreation Activity

There are six approaches to estimating the volume of recreation activity with and without OCS development: gravity-type models (including attribute-type models as used by the Granville Corporation), trip distribution models, time trends, participation models, combined gravity and time series models which use pooled time series and cross sectional data, and expert opinion. Data requirements are low for expert opinion, and moderate for gravity models, time trend models, and trip distribution models. Park attendance data and recreation participation rate data already exist from which to develop gravity, time series, or trip distribution models. To use expert opinion, experts must be assembled and scenarios must be developed for them to evaluate. This information pertains only to changes in recreation and not to baseline data, of course. The data for participation models to predict the number of recreationists using coastal areas with and without OCS development are unavailable.

Reliability of estimates varies for gravity-type models, depending on how well the data and specification overcome potential biases. Time trend analyses could be fairly reliable if sufficient data on recreation factors can be incorporated. Expert opinion is untested in its reliability. Participation models have tended to have rather poor measures of goodness of fit.

Table 3-4
Evaluation of Impact Methods

Problem/Method	Data Requirements	Reliability	Cost	Ease of Updating	Geographic Disaggregation	Linkages to Other Problems or Methods
Volume of Recreational Activity						
Gravity Type Model (including attribute models)	Moderate: need origin-destination data for site with and without OCS development. Can use existing data.	Varies: many sources of bias.	Moderate.	Easy: need new surveys conducted by state.	Recreation site specific, origin areas may be counties.	Needed for travel cost method.
Time Series	Moderate: need time series for sites with and without OCS development. Can use existing data.	Moderate to good, depending on inclusion of other factors besides OCS development.	Moderate.	Easy: need new surveys conducted by state.	Recreation site specific.	
Participation Models	Unlikely that data exist to estimate participation as a function of OCS development	Low: poor goodness of fit.	Moderate: if data already available.	Easy: need to conduct new participation survey.	Can be highly disaggregated but often not.	
Combined Gravity Type Model/Time Series	Moderate: see gravity and time series above.	Moderate.	Moderate.	Easy: see individual methods above.	Recreation site specific.	
Expert Opinion	Low: need to assemble experts and prepare scenarios, however.	Unknown.	Moderate.	Easy: reconvene experts.	Estimation for "Typical Sites" — must make inference about specific sites.	
Trip Distribution	Moderate: need participation data, site activity data, and initial trip distribution data.	Moderate	Moderate.	Easy once model is developed	Recreation site specific; origin areas may be counties.	Can be linked to travel cost method.
Estimation of Direct Impacts						
Combination of Several Existing Sources	Low for expenditures, moderate for location of expenditures.	Unknown — different sources may be at variance	Low to moderate	Easy if new data published.	Problematic — location of expenditures must be determined	Needed to estimate indirect impacts.

Table 3-4 (continued)
Evaluation of Impact Methods

Problem/Method	Data Requirements	Reliability	Cost	Ease of Updating	Geographic Disaggregation	Linkages to Other Problems or Methods
Estimation of Indirect Impacts on Coastal Communities						
Off-the-Shelf Input Output Models	RSRI, RIMS II, can be readily used. IMPLAN must be used in conjunction with U.S. Forest Service (Forest Service is willing to work with MMS).	RIMS II, probably overstates regional impacts, RSRI probably has best estimate of multipliers.	RIMS II available at AES; RSRI data must be purchased from vendor; IMPLAN must be used by agreement with U.S. Forest Service.	Models are regularly updated.	Any county	Linked to estimates of direct impacts.
Demand Schedules for Recreation Resources						
Travel Cost Method	Moderate: need gravity type model. If gravity type model estimated, costs are low.	Varies: many sources of bias in gravity type model.	Moderate	Easy: need new gravity type model surveys.	Recreation site specific — origin areas could be highly aggregated.	Need to have gravity type model for volume of recreational activity.
Hedonic Travel Cost	Large: need accurate origin-destination data.	Dependent on accuracy of O-D data.	Moderate to high.	Moderate: need new origin-destination data.	Same as RIM.	
Contingent Valuation Method	Large: need new surveys of willingness to pay or sell	Varies: many sources of potential bias.	Moderate to high	Moderate: need to conduct new surveys.	Probably highly aggregated because only limited number of surveys can be done.	
Unit Day Value Method	Low-to-moderate need site attributes, review of literature, and possibly public involvement.	Unknown: probably modest, contains many arbitrary assumptions.	Low	Easy	Recreation site specific.	

With regard to cost, trip distribution models are probably the most costly to develop because of their greater complexity, but this cost is probably not much greater than for other models. There does not seem to be a great cost disadvantage for any of the other methods.

All the models are relatively easy to update by recalibration, once new data have been collected. In the case of expert opinion updating takes place by reconvening the experts after some experience with OCS development has been gained.

With the exception of expert opinion, all the methods have the potential to yield estimates by recreation site, using origin areas (if necessary) at the county level. Expert opinion can probably only be obtained for typical or prototype sites, considering the large number of sites in California. Inferences must then be made to specific recreation sites.

The gravity-type or trip distribution models are a necessary input into the travel cost method of estimating demand schedules for recreation resources. Thus, there is a great advantage to this approach if the travel cost method is selected.

2. Estimation of Demand Schedules for Recreation Resources

There are three principal methods for estimating the consumer surplus for recreation with and without OCS development: the travel cost method, the contingent valuation or contingent market method, and the unit day value method. The land value method is considered impractical for this application. The hedonic travel cost method requires origin-destination data that is unavailable.

Data requirements are low for the unit day value method, moderate for the travel cost method (but they emerge from the gravity-type model for estimating the volume of recreation activity), and large for the contingent valuation method. We were not able to identify any set of willingness to pay studies on coastal recreation with and without OCS development for use in the project. Therefore the contingent valuation method would require a new survey which was not within the scope of this research.

Reliability varies greatly for the travel cost method and contingent valuation method because of the biases which can be introduced into the models. The reliability of the unit day value method is unknown but if it is checked against the literature on consumer surplus of recreation sites then it may be of modest reliability. However, the unit day value method does contain many arbitrary assumptions about the relative values of different recreation factors such as environmental quality, accessibility, carrying capacity, etc.

Costs are moderate for the travel cost method, especially since its costs can be partly attributed to the gravity-type model or trip distribution model. Unit day value costs are low because one uses a "cookbook" to obtain the answer. The contingent valuation method is likely to be the costliest because it requires that a new survey be undertaken.

All three methods could be updated readily, although the contingent valuation method would require a new survey. The travel cost method and unit day value method can provide geographically disaggregated demand schedules. The contingent valuation method would probably provide data only for typical sites because of the high costs of surveys.

3. Direct and Indirect Impacts on Coastal Communities

Several sources of data on recreation expenditures have been identified. These can be used to make estimates of expenditures per visit or per visitor day for various activities along coastal California without the need for additional surveys. The most costly element in applying these data is that incurred in apportioning expenditures to coastal California regions and to other regions, as there is little information on the location of expenditures. Different sources of data would have to be reconciled and put into common expenditure categories and into the same year's dollars.

Indirect impacts can best be estimated with off-the-shelf input-output models. Because of the high cost of undertaking a new survey for region specific input-output models, new surveys were not considered. There are three off-the-shelf input-output models: the RSRI model, RIMS II, and IMPLAN. They differ primarily in cost (RIMS II being the least expensive) and in how they estimate the proportion of inputs supplied from within the region. The RSRI model uses the most sophisticated method for performing the estimation. As a result, it probably has less of a tendency to overestimate multiplier effects than does the RIMS II model.

All three input-output models can provide multipliers for recreation impacts for any California county or group of counties. We believe that RIMS II offers the most cost-effective choice of the three, producing reasonably accurate results with a technique that can be implemented on the available computer system.

4. Method Selection

There are four key aspects to estimating the effects of OCS oil and gas development on coastal recreation: estimation of the changes in the volume of recreation activity due to OCS development, estimation of the effects in terms of demand schedules and consumer surplus, estimation of the changes in the direct impacts (expenditures) in coastal communities, and estimation of the indirect impacts on output, employment, or income in coastal communities. Based upon the data requirements, reliability, cost, ease of updating, geographic aggregation allowed by the various methods, and the linkages of one method to another, the following methods were selected for analyzing the effects of OCS development on recreation along the California coast. A key limitation was that we were precluded from collecting new data.

- For estimating the volume of recreation activity, some variant of a gravity model has an advantage because it links directly to the travel cost method for estimating consumer surplus and because the data needed to implement it is available. However, the model requires adjustments for some beaches, because most recreationists live close to the beach and most observations will be from the nearest origin zone. Data for origin zones had to be disaggregated finely enough to allow analysis of nearby beachgoers.

- For estimating the demand schedules for recreation resources and hence the consumer surplus of recreation, the travel cost method is most useful. It is linked to the gravity-type models and thus requires the least additional data. However, it does not work well where most recreationists live close to the beach and incur very low travel costs. The origin zone disaggregation done for the gravity model rectifies this problem.

- For estimating the direct impacts of changes in recreationists' expenditures, the several existing sources of coastal recreation expenditure data were combined and reconciled, expenditures by region were disaggregated, and these data were applied to the changes in the volume of recreation activity attributable to OCS development.

- For estimating the indirect impacts of changes in expenditures, a non-survey input-output model was used. On the basis of cost-effectiveness RIMS II was selected.

III. METHODOLOGY SELECTED

A. Introduction and Approach

This Chapter discusses the methods that are used in this study to determine the economic impacts of OCS development on coastal recreation. We have divided the methodology into three components that will be described in turn. First, a **gravity model** is used to estimate the volume of recreation, by activity, at coastal destinations. This model incorporates an "attractiveness" index that can vary with OCS development. The model also provides the origins and destinations of recreation trips, information necessary in the consumer surplus model.

The **economic effects model** has two parts. The first part estimates the direct spending from recreation trips in each coastal segment. The second part aggregates direct spending to the county level, then estimates the secondary economic effects throughout the county economy.

The third component is the **consumer surplus model**. Consumer surplus is a measure of the amount that people would be willing to pay to recreate, that is over and above the amount they actually have to pay. Consumer surplus is used as a measure of the economic value of recreation sites. This model estimates demand curves for recreation in each coastal segment, using information on the origins of recreationists. From the demand curves, the net loss in consumer surplus from changes in OCS activities or from oil spills is determined.

The three model components could be operated independently, but in this project the components have been linked together to simplify their implementation. As described in **Volume 4: The User's Guide**, a user supplies information about the scenario being evaluated and its regional setting. The results from each model are then entered into subsequent models automatically. For example, the gravity model will produce attendance estimates for each coastal segment, and the attendance output is then fed to both the economics effects model and the consumer surplus model.

The next three sections describe the model components in detail.

B. Gravity Model

1. Introduction and Theory

Given a choice of places to seek similar forms of recreation, we assume that a person will choose the most attractive place. We also assume, however, that the person's choice is likely to be influenced by the length of time it might take to travel to each potential location, and that most people would prefer to travel short distances to recreate as opposed to long distances. From an operational standpoint, those two assumptions define a dual objective function for the locational decisions of recreators. They must simultaneously attempt to satisfy their desire for attractive places to recreate and to minimize their travel time.

The gravity model provides a framework for estimating the solution to such a decisional problem. Given a set of possible destination zones, a pool of potential recreators unevenly located in a set of origin zones, and considering the behavioral response to the effect of travel time, the model seeks the most likely distribution of recreational trips between all origin and destination pairs.

The form of the model derives from Newton's law of gravity:

$$F = K(M_i M_j)/d^2$$

where

> F is the force of gravity between two bodies, i and j;
>
> M_i and M_j are the masses of the two bodies;
>
> d is the distance between the two; and
>
> k is a constant of proportionality.

First applied by Ravenstein (1885) to migration flows, and popularized shortly after World War II (Stewart, 1947; Zipf, 1949), the same essential form has been found to provide a very good approximation to many different types of human-related movements. Although its theoretical roots lie in an analogy between gravitational forces of attraction and the propensity for people to travel between specific origin-destination pairs according to their proximity, its performance as a tool for explaining human spatial interaction is remarkable.

The general form of the gravity model explaining travel patterns is as follows:

$$I_{ij} = k(P_i P_j)/f(d_{ij})$$

where

> I_{ij} is the expected interaction between place i and place j;
>
> P_i and P_j are the populations of the two places;
>
> $f(d_{ij})$ is a function of the distance between them; and
>
> k is a constant of proportionality.

The model has been used to explain interactions of many kinds between two centers of population, including telephone calls, migration patterns, transfer of goods and services, and so on. (A good review is presented in Carrothers, 1956).

When extended to account for flows between a set of origins and destinations, the gravity model is usually expressed as a potential model:

$$PI_{ij} = I_{ij} / \sum_j I_{ij}$$

where

> PI_{ij} is the potential for interaction by origin i with destination j, and with all other destinations considered.

This is the basic form used in the current application. It can be expressed as a probability for interaction by a single individual, and when multiplied by the number of possible recreationists from an origin, it yields their likely distribution to the set of destinations.

Most of the theoretical work on the gravity model has focused on the appropriate value of the constant, k, and on the nature of the distance function, f. In the current application, we are fortunate to draw on the work of the California Department of Parks and Recreation, who have estimated the critical details of both of those features of the model. The value of k, in their derivation, is actually not a constant at all. It varies by both origin and by destination, a feature which allows for even greater model flexibility and explanatory power. For origins, they have estimated its value in terms of participation rates for the populations of each California county (Figure 3-5). Furthermore, their estimates are specific to several different kinds of recreational activities. For destinations, their form of the model includes a factor to represent the attractiveness of different sections of the California coastline (Figure 3-6). And they have estimated both the form and specific parameters of a distance function for the model, which also varies according to the type of recreational activity.

The California Department of Parks and Recreation potential (or trip distribution) model is of the following basic form:

$$V_{ij} = [(r_i P_i A_j)/f(d_{ij})] \,/ \sum_j [A_j/f(d_{ij})]$$

where

V_{ij} is the expected number of visits (to participate in a particular recreational activity) from county i to coastline section j;

r_i is the per capita rate of participation by residents of county i;

P_i is the population of county i; and

A_j is a measure of the attractiveness of coastline section j.

For the application being discussed here, we have used the same form of trip distribution model. We adapted the participation rates to conform to the activity categories of interest, and used the distance functions estimated by the Department as appropriate. However, we estimated specific measures of attractiveness to take account of OCS activity. Details of each of these features are given in the following sections.

2. Participation Rates

Relying heavily on information provided by the California Department of Parks and Recreation (CDPR), we have estimated annual per capita participation rates for all 58 California counties. For each origin county, we estimate participation rates for each of four ocean-oriented recreational activity categories: boating, ocean fishing, water-dependent beach activities, and water-enhanced beach activities. Using survey work and modelling carried out by CDPR, we derive these rates by adjusting base participation rates to account for the socioeconomic characteristics of each origin county and for the geographic relationship between those counties and the California coastline. Except for ocean fishing, the activity categories are aggregates of individual activities addressed by CDPR as follows:

> **Boating** includes power boating, sailing, and other boating; **ocean fishing** is strictly saltwater fishing; **water-dependent activities** include ocean swimming, scuba and snorkeling, body surfing, and board surfing; and **water-enhanced beach activities** include picnicking, hiking/backpacking,

Figure 3-5


OREGON
NEVADA
ARIZONA
MEXICO
PACIFIC OCEAN
CALIFORNIA'S
58 COUNTIES
Del Norte
Siskiyou
Modoc
Humboldt
Trinity
Shasta
Lassen
Tehama
Plumas
Mendocino
Glenn
Butte
Sierra
Colusa
Yuba
Nevada
Lake
Sutter
Placer
Sonoma
Yolo
El Dorado
Napa
Sacra mento
Alpine
Solano
Amador
Marin
Calaveras
Contra Costa
San Joaquin
Tuolumne
Mono
San Francisco
Alameda
San Mateo
Stanislaus
Mariposa
Santa Clara
Merced
Madera
Santa Cruz
San Benito
Fresno
Inyo
Tulare
Monterey
Kings
San Luis Obispo
Kern
San Bernardino
Santa Barbara
Ventura
Los Angeles
Orange
Riverside
San Diego
Imperial

Figure 3-6
California Coastal Recreation Zones (Geopieces)

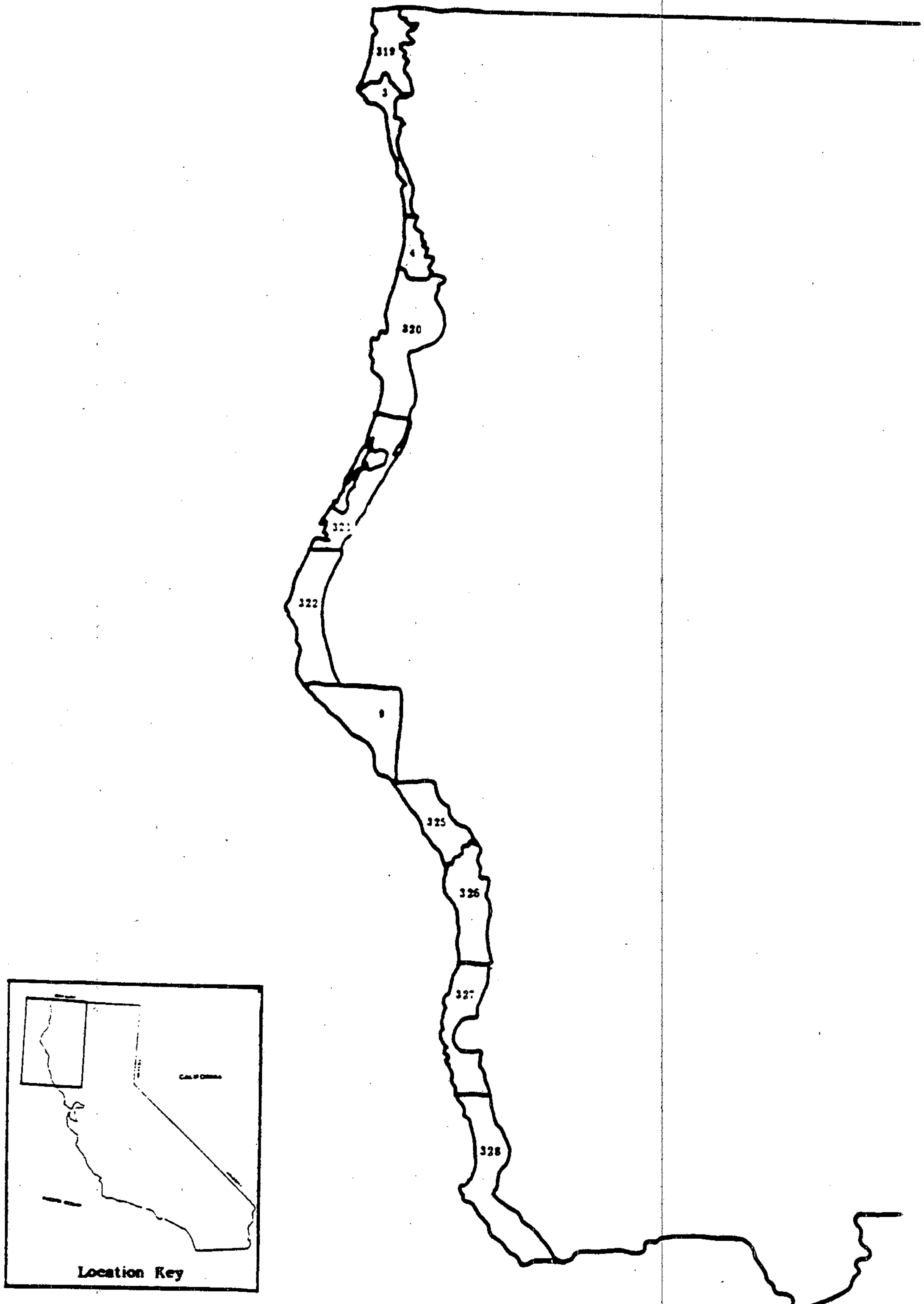


Figure 3-6 (con't)
California Coastal Recreation Zones (Geopieces)

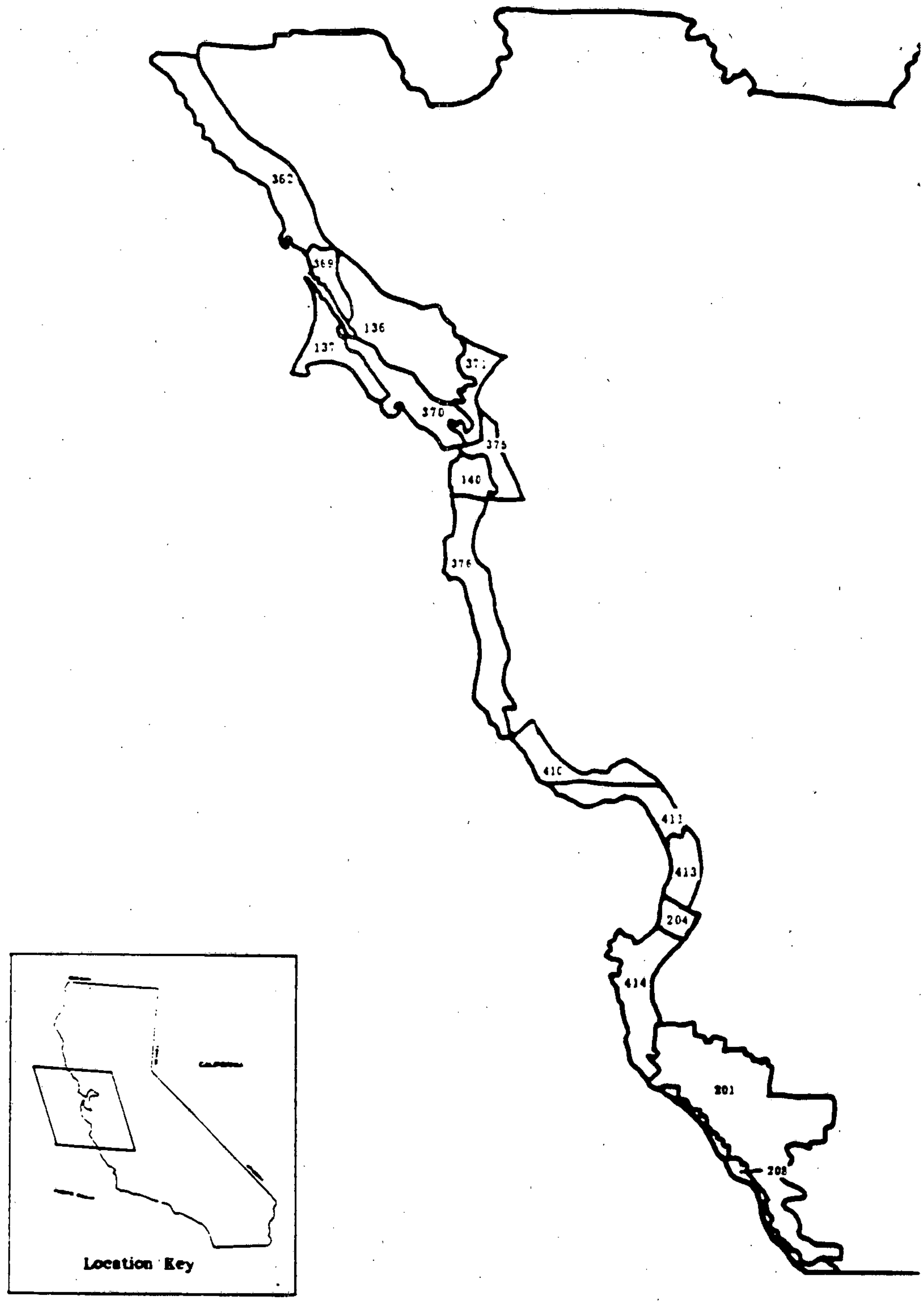
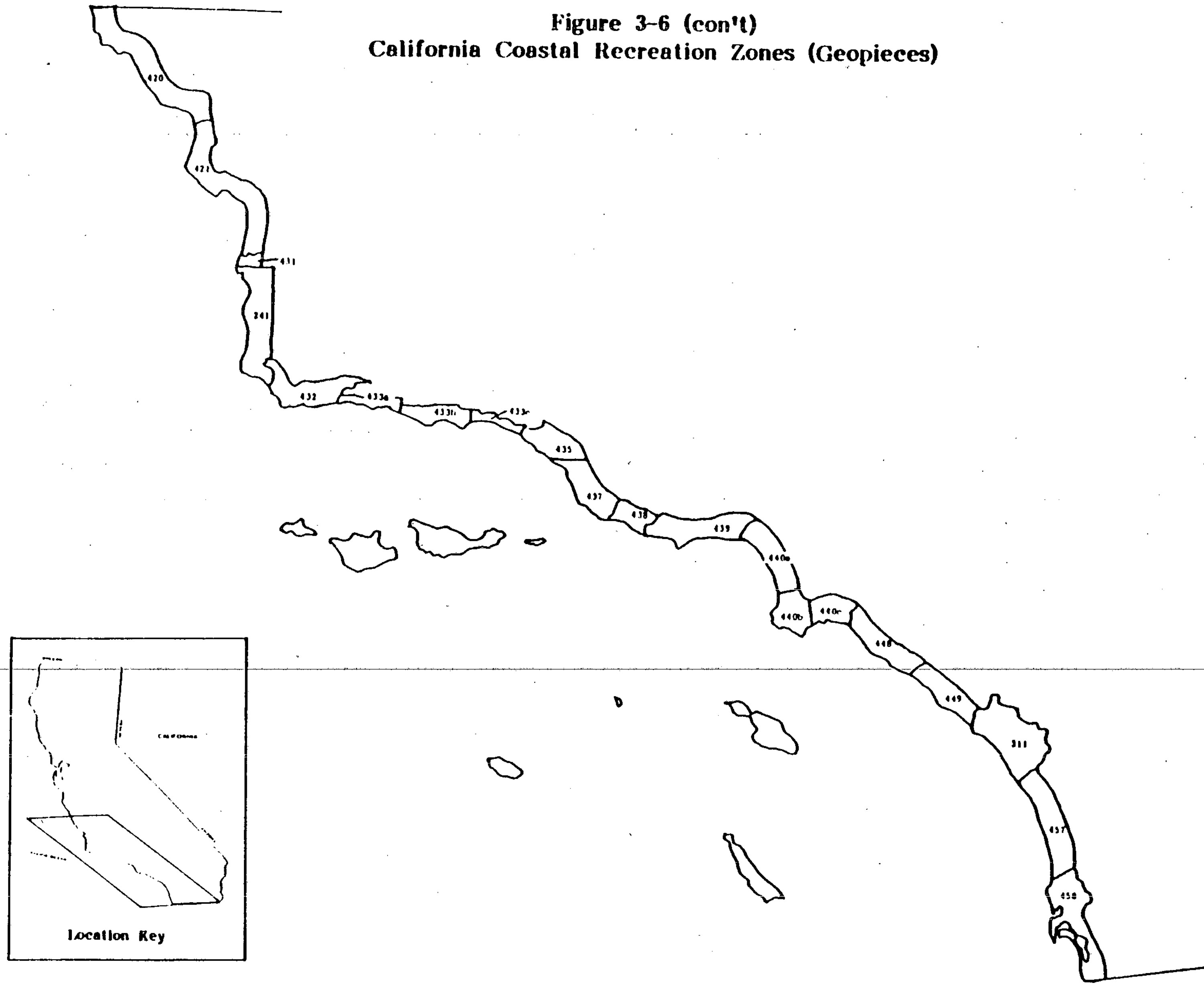


Figure 3-6 (con't)
California Coastal Recreation Zones (Geopieces)



nature appreciation, visiting scenic areas, sunning, beachcombing, beach games, and camping.

In our four ocean-oriented recreation categories, therefore, we actually consider sixteen specific activities analyzed by CDPR. For each of those sixteen activities, the CDPR has estimated participation "base rates" which vary according to a distinction made between counties from Northern and Southern California (Table 3-5).

Base Rates. The northern and southern base rates differ mainly in the water-dependent beach activities. In essence, Northern California residents are far less likely to enter the water than Southern California residents. This is due to the wide difference in ocean temperatures -- the waters north of Pt. Conception are influenced by the California current, and their temperature is as much as 10 degrees fahrenheit colder than the southern waters. In contrast, however, the Northern California residents are more likely to participate in water-enhanced beach activities than their southern counterparts. Though, area-wise and population-wise, they represent about half the state, only 10 of the 58 California counties are considered to be southern for the CDPR analysis. Those include Imperial, Kern, Los Angeles, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, and Ventura.

Adjustment of Base Rates by Socioeconomic Characteristics. Beginning with the difference in base participation rates between northern and southern counties, the CDPR procedure then derives participation rates for each county according to differences in socioeconomic characteristics of the populations of those counties. These characteristics include:

i. Occupational structure -- five partitions — white collar/managerial, services/clerical, sales, blue collar, and other;

ii. Sex;

iii. Family income — five partitions — less than $7,000, $7,000 to $14,999, $15,000 to $24,999, $25,000 to $34,999, and over $35,000 (with respect to 1979 family incomes);

iv. Ethnic structure -- 4 partitions -- hispanic, white, black, and asian/others;

v. Education -- 4 partitions -- less than high school, high school, some college, and advanced degree; and

vi. Age structure — 7 partitions — 0 to 17 years, 18 to 24, 25 to 34, 35 to 44, 45 to 54, 55 to 64, and 65 and over.

For each socioeconomic characteristic, the distribution of population (according to the 1980 census) for each California county was enumerated. Per capita participation rates for each partition were derived by CDPR based on survey data for each activity. The per capita rates were then weighted according to the importance of a particular socioeconomic characteristic as an influence on overall participation in a particular activity. This procedure yielded a base rate adjustment derived from the specific socioeconomic characteristics in each county, that is applied to the northern and southern base rates.

Table 3-5. North and South Base Rates by Activity

ACTIVITY	North	South
Boating		
Power Boating	0.51	0.51
Sailing	0.34	0.34
Other Boating	0.46	0.23
Saltwater Fishing	0.56	0.56
Water-Dependent Beach		
Ocean Swimming	0.94	2.91
Scuba/Snorkeling	0.05	0.47
Body Surfing	0.20	1.39
Board Surfing	0.11	0.93
Water-Enhanced Beach		
Picnicking	3.79	3.79
Hiking/Backpacking	3.28	2.29
Nature Appreciation	4.08	2.67
Visiting Scenic Areas	3.34	1.84
Sunning	2.11	2.11
Beach Combing	0.59	0.46
Beach Games	0.94	0.94
Camping	2.86	2.28

Source: California Department of Parks and Recreation

The two basic steps to this procedure, for each county and each activity are as follows:

1) $R_s = \sum_p R_p P_p$

where

R_s is the per capita rate, for a specific socioeconomic category s, to be applied to each county resident

R_p is the per capita participation rate specific to partition p of the particular socioeconomic characteristic

P_p is the proportion of the total county population belonging to the particular partition p

2) $R_w = R_b + \sum_s K_s (R_s - R_b)$

where

R_w is the weighted per capita participation rate in the given activity

k_s is CDPR's weight of the relative assumed importance of socioeconomic characteristic s to participation in that activity

R_b is the north or south base rate for the activity.

In essence, the procedure serves to increase or decrease the base rate of participation according to the socioeconomic structure of a particular county.

In this study we had access to the results of CDPR's cross-sorts of participation rates by socioeconomic characteristic. If we had access to the original data we could have instead used multiple regression techniques to analyze socioeconomic characteristics, and the results might be somewhat different.

Adjustment for Proximity to Coastline. A further adjustment to the per capita rates of participation was required to make them appropriate for this application. Whereas the CDPR was concerned with participation in all portions of the state, we are concerned only with participation in the coastal areas.

Six of the sixteen activities are specific to ocean-related recreation and would only occur along the coast -- ocean swimming, body surfing, board surfing, beachcombing, beach games, and saltwater fishing. The per capita rates derived by the CDPR procedure for these activities, therefore, require no adjustment. The remaining activities, however, could occur elsewhere in the state, and for our purposes the per capita rates for those activities had to be adjusted to specify only the participation in coastal segments.

For that purpose, we requested a special run of the CDPR model from the Department for the ten remaining activities. The CDPR model allocates total participation by activity to 470 sections (called "geopieces") of the state. Of those sections, 45 are along the coast, and we calculated the percent of total participation output by the CDPR model that was expected to occur in those 45 sections (Table 3-6). Only for sailing does the percentage exceed 50 percent. By contrast, less than 8 percent of participation in hiking and backpacking is expected to occur in coastal segments.

Table 3-6 Total and coastal demand for participation (thousands), by activity.

Activity	Participation Total	Participation Coastal	Percent Coastal
Power boating	12,013	3,436	28.6
Sailing	7,813	4,046	51.8
Other boating	7,548	1,044	13.8
Scuba/snorkeling	5,761	2,034	35.3
Picnicking	88,747	17,491	19.7
Hiking/backpacking	62,119	4,789	7.7
Nature appreciation	75,141	8,591	11.4
Visiting scenic areas	54,760	5,828	10.6
Sunning	49,751	12,708	25.5
Camping	59,113	6,584	11.1

Source: Estimated by California Department of Parks and Recreation, May 1985.

The results of the special model run were utilized to adjust per capita rates for the ten activities. Overall, the total participation in each activity was reduced according to the percentages calculated, but rates were adjusted by different amounts depending on proximity of an origin county to the coast. The travel time from each origin county to the nearest coastal geopiece was determined, and used to derive a weighting (between 0 and 1) for assigning coastal participation in each activity to each origin county. The weighting for each activity was calculated as follows:

3) $w_i = r_i p_i \, f(d_i) \,/ \sum_i r_i p_i \, f(d_i)$

where

w_i is the weighting associated with county i

r_i is the originally-calculated per capita rate for county i

p_i is the population of county i

d_i is the distance (in units of travel time) from county i to the coast

f is a function of travel time (discussed in the following section)

In the second step, the coastal demand (CD^T from column 2 of Table 3-6) for each activity was multiplied by the weightings for each county to obtain the estimated demand for coastal recreation in each activity for that county:

4) $CD_i = CD^T \cdot w_i$

where

CD^T = total coastal demand

Finally, the per capita rate for county i was calculated,

5) $r_i = CD_i \,/\, p_i$

by dividing the coastal demand from each county by that county's population.

Final Calculation. The per capita participation rates for each individual activity were summed to obtain the adjusted per capita rates for activity categories that are displayed in Table 3-7. Each rate can be interpreted as the average number of visitor-days per year spent by each member of the population of a given county to participate in a given activity at a coastal geopiece. Finally, the population of each county is multiplied by these adjusted participation rates to derive the total visitor-days in coastal recreation by county of origin. These visitor-days are shown in Table 3-8.

3. Distance-Decay Function

One major assumption of the gravity modelling approach is that recreationists would prefer to travel short distances instead of long distances. The f(d) term in the gravity formulation we are using is meant to capture this behavioral assumption. The propensity of recreationists to travel different distances, d, to recreate is represented by f(d). In general, the greater the distance from an

Table 3-7 . Annual Per Capita Participation Rates Used in the Gravity Model, by County of Origin

County	Boating	Fishing	Beach Activity W.Dep.	Beach Activity W.Enh.
ALAMEDA	0.46	0.54	1.64	4.45
ALPINE	.00	0.55	1.69	1.87
AMADOR	0.09	0.54	1.52	2.34
BUTTE	0.03	0.51	1.48	1.99
CALAVERAS	0.08	0.52	1.45	2.22
COLUSA	0.10	0.51	1.48	2.33
CONTRA COSTA	0.43	0.54	1.66	4.26
DEL NORTE	0.46	0.51	1.50	4.51
EL DORADO	0.07	0.53	1.58	2.30
FRESNO	0.06	0.52	1.54	2.15
GLENN	0.05	0.43	1.46	2.06
HUMBOLDT	0.50	0.52	1.62	4.81
IMPERIAL	0.06	0.50	4.84	2.05
INYO	.00	0.51	1.44	1.58
KERN	0.07	0.51	4.73	2.18
KINGS	0.08	0.51	1.56	2.31
LAKE	0.10	0.50	1.35	2.26
LASSEN	0.00	0.53	1.55	1.64
LOS ANGELES	0.38	0.53	4.81	3.90
MADERA	0.09	0.52	1.52	2.34
MARIN	0.64	0.56	1.72	5.21
MARIPOSA	0.04	0.52	1.48	1.99
MENDOCINO	0.19	0.52	1.58	3.01
MERCED	0.11	0.51	1.57	2.50
MODOC	0.00	0.51	1.46	1.48
MONO	0.00	0.55	1.73	1.78
MONTEREY	0.51	0.52	1.61	4.79
NAPA	0.41	0.52	1.56	4.13
NEVADA	0.09	0.52	1.52	2.33
ORANGE	0.44	0.54	5.02	4.21
PLACER	0.11	0.53	1.60	2.49
PLUMAS	.00	0.52	1.49	1.69
RIVERSIDE	0.21	0.51	4.55	2.99
SACRAMENTO	0.18	0.53	1.63	2.94
SAN BENITO	0.36	0.51	1.55	3.93
SAN BERNADINO	0.19	0.52	4.84	2.96
SAN DIEGO	0.48	0.53	4.94	4.44
SAN FRANCISCO	0.54	0.54	1.61	4.72
SAN JOAQUIN	0.19	0.51	1.56	2.97
SAN LUIS OBISPO	0.45	0.53	4.87	4.35
SAN MATEO	0.57	0.54	1.63	4.86
SANTA BARBARA	0.39	0.53	4.99	4.01
SANTA CLARA	0.40	0.54	1.70	4.17
SANTA CRUZ	0.50	0.52	1.58	4.80
SHASTA	0.02	0.52	1.50	1.85
SIERRA	0.01	0.52	1.49	1.78
SISKIYOU	.00	0.52	1.47	1.57
SOLANO	0.40	0.53	1.65	4.23
SONOMA	0.33	0.53	1.62	3.79
STANISLAUS	0.17	0.51	1.58	2.89
SUTTER	0.10	0.51	1.55	2.39
TEHAMA	0.02	0.50	1.43	1.86
TRINITY	0.06	0.52	1.50	2.15

Table 3-7 continued

TULARE	0.06	0.50	1.52	2.14
TUOLUMNE	0.05	0.52	1.51	2.11
VENTURA	0.48	0.53	4.93	4.34
YOLO	0.19	0.53	1.67	3.10
YUBA	0.09	0.51	1.54	2.40

Source: Estimated by Applied Economic Systems, April 1985, based on information provided by the California Department of Parks and Recreation.

Table 3-8

Estimated Annual Visitor Days (000) in Coastal Recreation by County of Origin, 1984

County	Boating	Fishing	Beach Activity W. Dep.	Beach Activity W. Enh.
Alameda	539	633	1,923	5,217
Alpine	*	1	2	2
Amador	2	12	33	50
Butte	5	80	233	313
Calaveras	2	13	36	55
Colusa	1	7	21	33
Contre Costa	298	375	1,151	2,955
Del Norte	9	9	28	84
El Dorado	7	52	154	224
Fresno	34	290	860	1,201
Glenn	1	10	33	47
Humboldt	56	58	180	535
Imperial	6	51	492	209
Inyo	*	9	26	29
Kern	32	232	2,152	992
Kings	6	41	126	186
Lake	4	22	59	99
Lassen	*	13	37	39
Los Angeles	2,989	4,169	37,840	30,681
Madera	7	38	110	170
Marin	144	126	387	1,172
Mariposa	1	7	19	25
Mendocino	13	37	112	214
Merced	16	76	235	375
Modoc	*	5	14	14
Mono	*	5	16	17
Monterey	161	164	509	1,514
Napa	42	53	159	420
Nevada	6	33	97	148
Orange	909	1,116	10,374	8,700
Placer	14	69	209	325
Plumas	*	10	27	31
Riverside	159	386	3,446	2,265

* - less than 500

Table 3-8

Estimated Annual Visitor Days (000) in Coastal Recreation
by County of Origin, 1984
(page 2 of 2)

County	Boating	Fishing	Beach Activity W. Dep.	Beach Activity W. Enh.
Sacramento	155	455	1,399	2,524
San Benito	10	15	44	112
San Bernadino	193	520	4,910	3,003
San Diego	980	1,082	10,082	9,062
San Francisco	382	382	1,138	3,337
San Joaquin	74	199	609	1,160
San Luis Obispo	79	93	856	764
San Mateo	344	326	984	2,934
Santa Barbara	125	170	1,599	1,285
Santa Clara	546	737	2,321	5,693
Santa Cruz	102	106	321	975
Shasta	2	65	187	231
Sierra	*	2	5	6
Siskiyou	*	22	61	65
Solano	105	139	434	1,112
Sonoma	107	171	523	1,225
Stanislaus	50	149	462	845
Sutter	6	29	88	135
Tehama	1	21	61	79
Trinity	1	7	20	28
Tulare	16	135	409	576
Tuolumne	2	20	57	80
Ventura	278	307	2,859	2,517
Yolo	23	63	200	371
Yuba	5	27	80	125
STATE TOTAL	9,048	13,450	90,810	96,584

* - less than 500

Source: Estimated by Applied Economic Systems, 1984 based on information provided by the California Department of Parks and Recreation.

origin to a destination the less likely it is that a person will be willing to travel that distance, implying that the propensity should diminish as travel distances increase. This is rarely a linear effect, however, and it is generally believed that the effect diminishes per unit of distance as distance increases. In the vernacular of gravity modelling, this effect is known as distance decay. For example, the difference between one and two miles is thought to have a greater effect on willingness to travel than the difference between 99 and 100 miles.

Estimating the particular function of distance associated with a particular kind of travel has occupied the majority of theoretical work on the gravity model. Fortunately for us, the CDPR has accomplished that work with respect to recreational travel among California residents. In their work the CDPR uses travel-time to represent the distance between each origin-destination pair. In this study we follow CDPR in using travel-time instead of distance. This choice allows us to use the CDPR matrix of travel-times between each origin and each destination. The use of time instead of distance also allows a direct calculation of the opportunity cost of time during travel, although travel-time must be converted to distance to compute vehicle operating cost. (See discussion of travel cost estimating in Section III.D.3. in this volume.)

The CDPR used statewide data to estimate statewide distance-decay functions for each activity. They fit curves of the following form to data derived from surveys specific to each kind of activity:

$$6)\ f(d) = c \cdot e^{-(a^2 \cdot (D_{ij} - b)^2)}$$

where

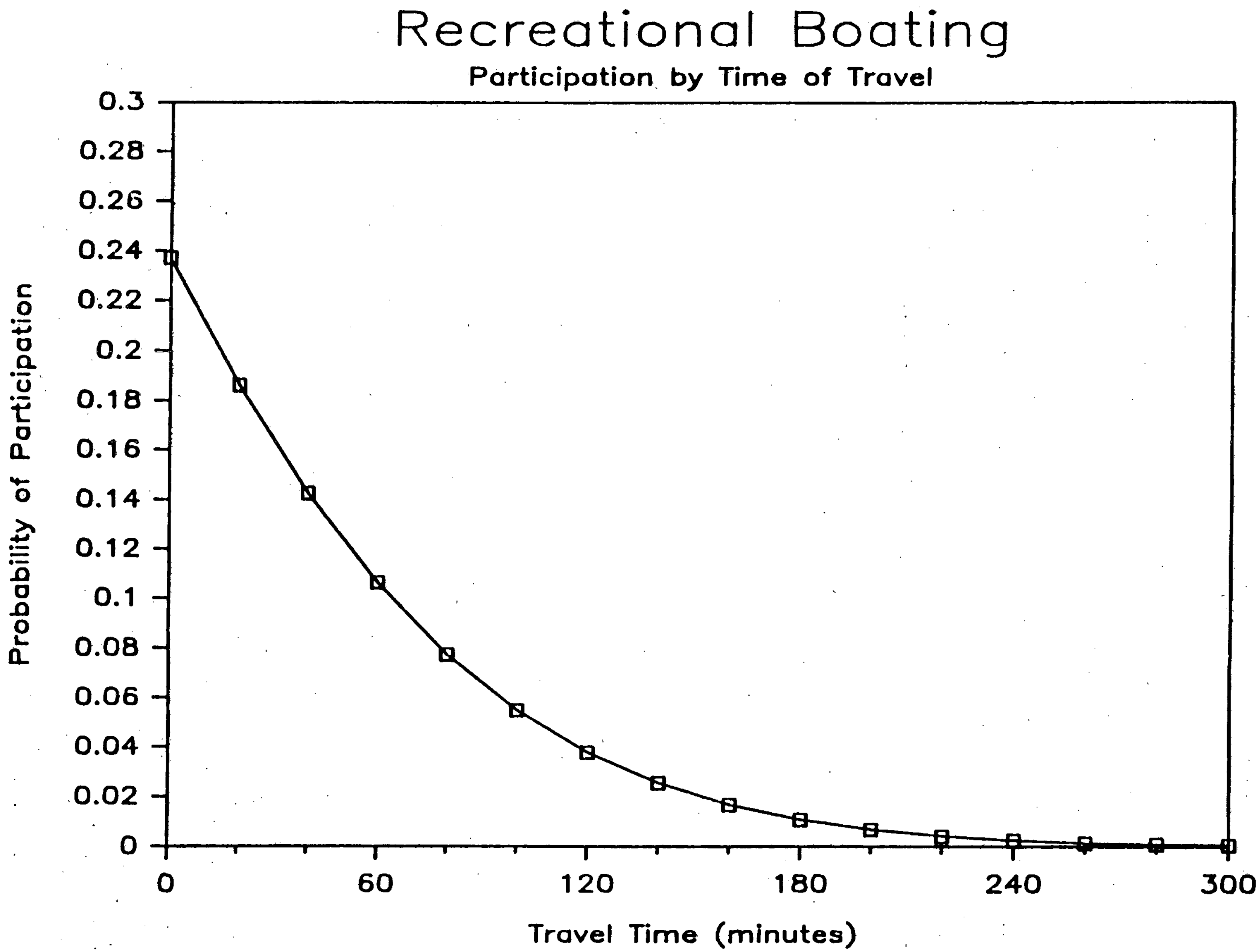
- f(d) is the distance-decay function for a given activity;
- D_{ij} is the distance in units of travel time (20 minute intervals) from an origin to a destination;
- e is the exponential function;
- a, b, and c are parameters specific to each activity estimated by statistically fitting curves to the data;
- a determines the steepness of the curve;
- b determines the travel-time at which participation rates peak; and
- c scales the overall distance-decay function up or down.

Through parameter b the general curve allows for the possibility that the peak participation rate occurs at some travel-time significantly greater than zero ($b>0$). This pattern occurs, for example, in activities such as camping where some minimum travel-time is usually required to reach the nearest facility. For coastal activities, however, the peak participation rates occur at zero travel-time ($b\leq 0$). (See Figures 3-7 to 3-10).

The decay function theoretically becomes asymptotic to zero at large distances, implying that a few recreationists may travel long distances to particular recreation sites. In practice, however, the curve is truncated when travel times are long (over approximately 6 hours) and participation rates are therefore insignificant.

The CDPR provided us with all of the ingredients necessary to implement their distance-decay functions in our application, including a matrix of travel times from all California counties to each coastal geopiece, and the a, b, and c parameters for all activities. Since our application utilizes combinations of the activities modelled by the CDPR, we would ideally have applied weighted

Figure 3-7



Recreational Boating
Participation by Time of Travel
Probability of Participation
0.3
0.28
0.26
0.24
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0
60
120
180
240
300
Travel Time (minutes)

Figure 3-8

Recreational Fishing

Participation by Time of Travel

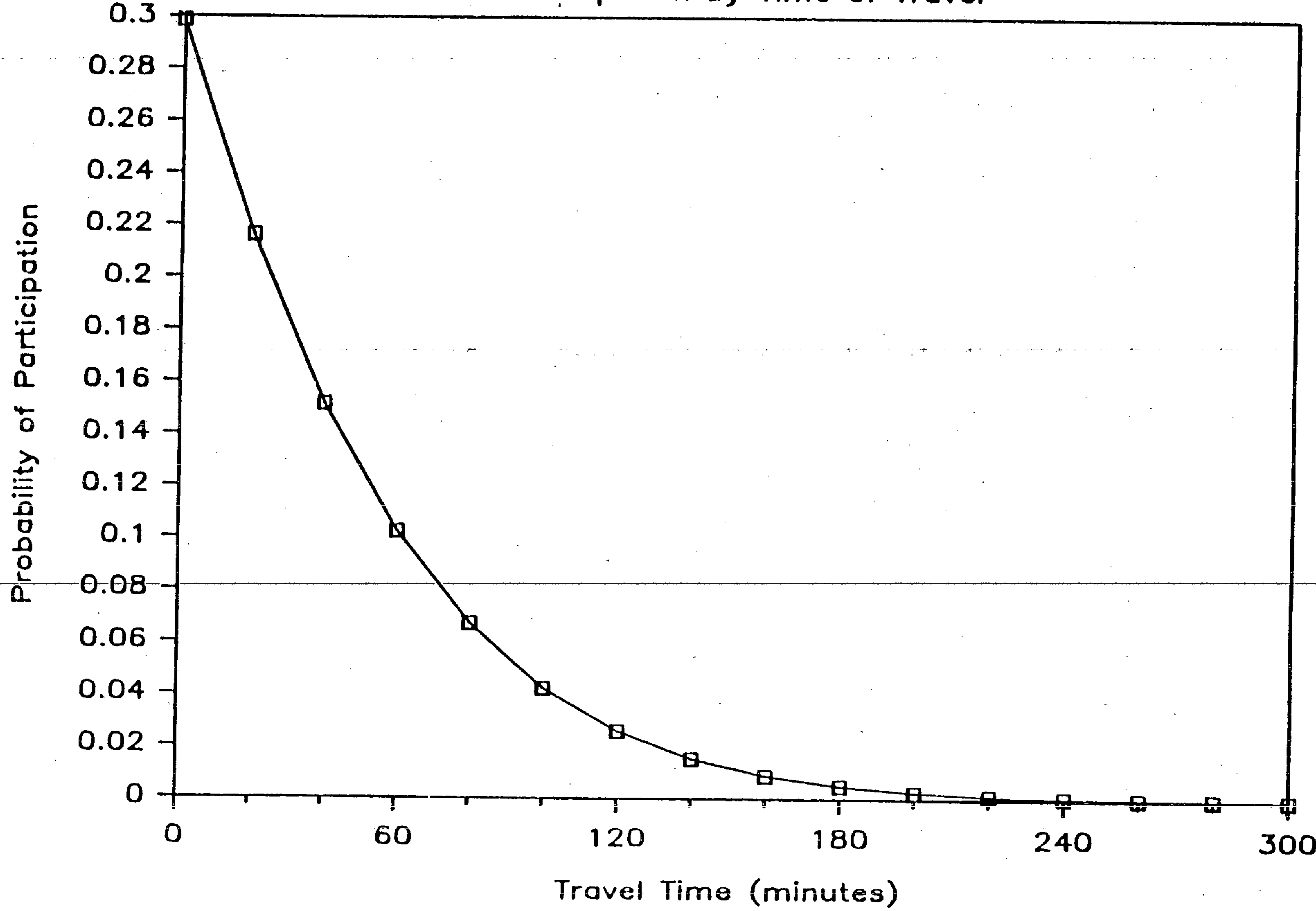


Figure 3-[illegible]

Water-Dependent Beach Activities

Participation by Time of Travel

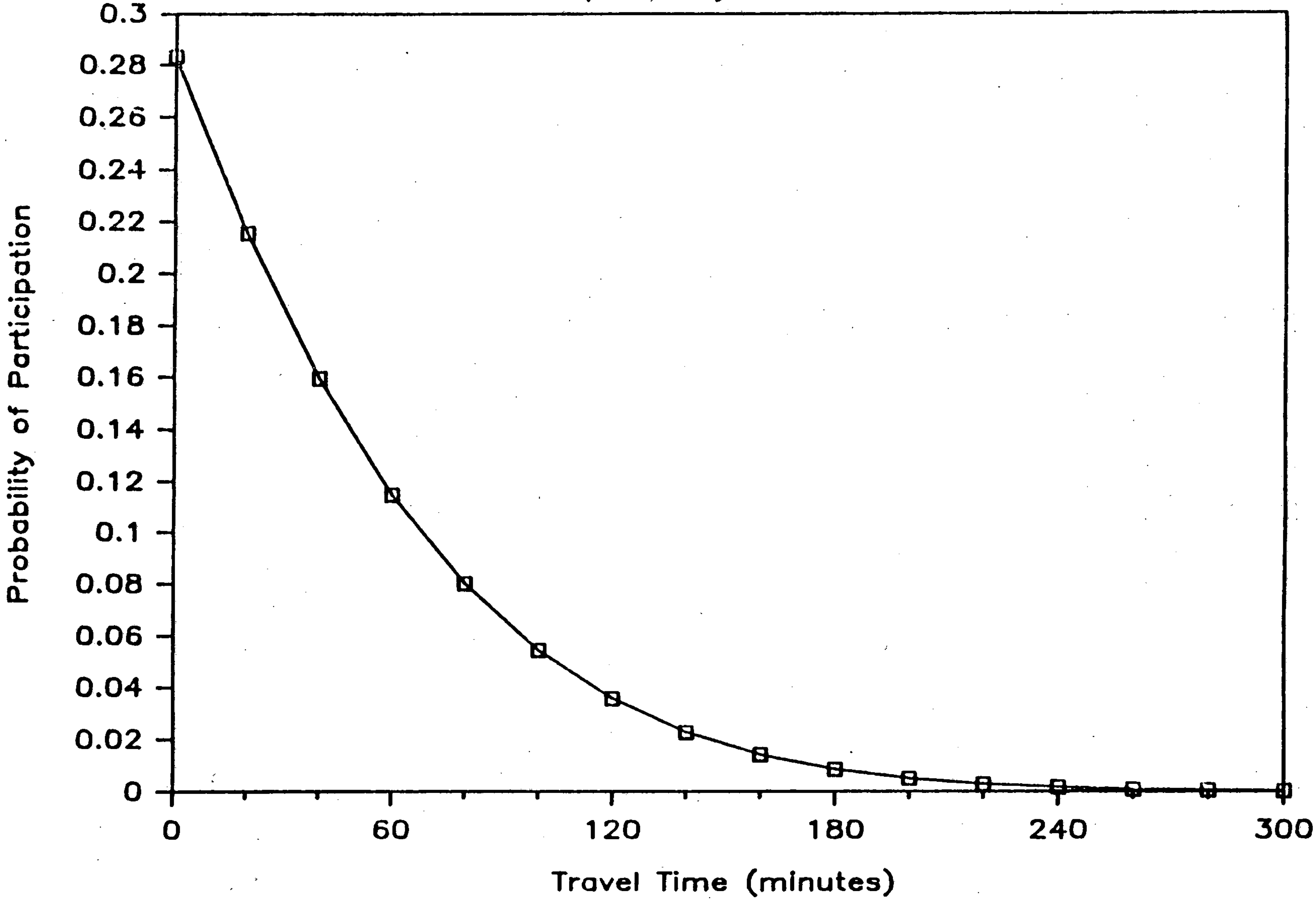
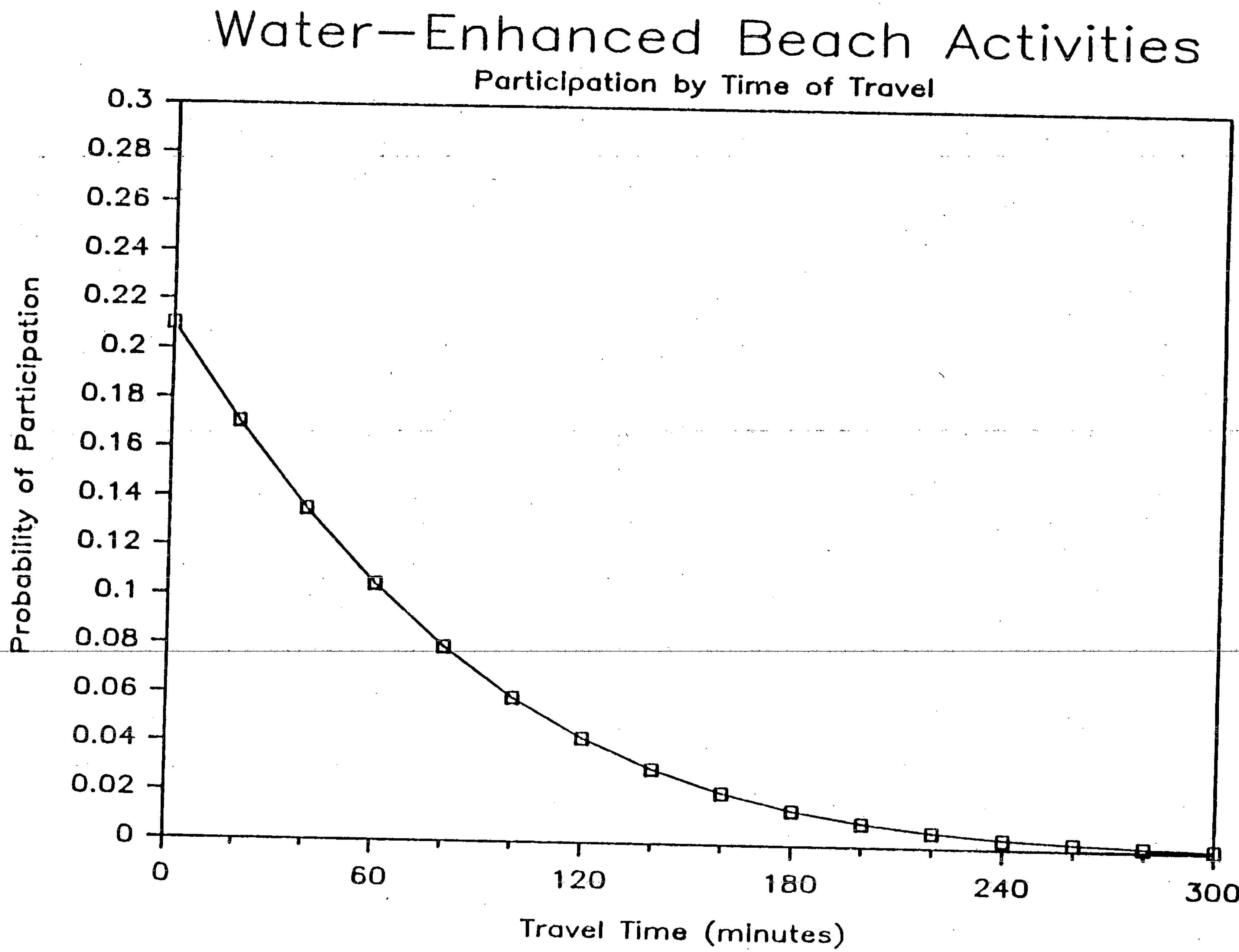


Figure 3-10


Water-Enhanced Beach Activities
Participation by Time of Travel
0.3
0.28
0.26
0.24
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Probability of Participation
0
60
120
180
240
300
Travel Time (minutes)

averages of the curves for individual activities. As it turns out, however, the particular functional form they derived does not lend itself to aggregation. Derivation of a weighted average of the functions is mathematically impossible. Therefore, we used individual decay functions to represent each category.

Since our fishing category is but a single one of their activities, we were able to use their decay function for fishing exactly. For the other three categories, however, we decided to choose the function that most represented the particular category. Representativeness was decided both on the basis of the base rates for individual activities and on the basis of similarity between functional forms. For our boating category, we used their function for power boating. For our water-dependent beach activities category, we used their function for ocean swimming, and for our water-enhanced beach activities category, we used their function for visiting scenic areas (Table 3-9). The decay functions used are shown in Figures 3-7 through 3-10.

Table 3-9
Distance-Decay Function Parameters used in the Gravity Model

Activity Category	a	b	c
Boating	.1128	-9	.6653
Fishing	.1302	-9	1.1791
Water-dependent beach	.1198	-9	.9064
Water-enhanced beach	.1051	-9	.5148

a, b, and c are parameters estimated by statistically fitting distance-travelled data to equation (6), above. For example, the equation fitted for boating is: $f(d) = .6653 \cdot e^{-[.1128^2 (D_{ij} + 9)^2]}$. The significance of each parameter is discussed in the text accompanying equation (6).

Source: California Department of Parks and Recreation

4. Attractiveness Indices

The gravity model distributes recreation trips from origin zones to coastal destinations according to the distances between origin-destination pairs and the relative attractiveness index for each destination. The attractiveness index is a relative measure of the appeal of each geopiece for coastal recreation. It does not measure attendance by itself, but is one factor that helps to explain attendance patterns. This attractiveness index is a function of a set of beach attributes, including some effects from OCS development. The purpose of this section is to describe the estimation of the attractiveness indices for each of the four activities.

a. Beach Related Attractiveness Indices

Our approach to developing an attractiveness measure for the beach related activities is first to use statistical methods to analyze all the factors affecting beach attendance. Then the attractiveness index itself is calculated by removing the factors already accounted for in the trip distribution model. The following subsections will first detail the elements of the beach attendance estimation, and then derive the attractiveness index.

i. Models of Beach Attendance

We first estimate the factors affecting attendance on a set of beach attributes and on a single variable that incorporates origin population, origin participation rates, distance from each origin to the geopiece containing the beach, and distance to all substitute coastal geopieces. This composite variable is crucial to the attendance regression, because it explains much of the variation in attendance across beaches. Note the four elements of the composite variable are explicitly included in the remainder of the trip distribution model. Our attendance regression model is:

$$Attendance_j = f(PROXIMITY_j, BEACH_j)$$

where

$Attendance_j$ = attendance at $beach_j$

$PROXIMITY_j$ = g ($population_i$, participation $rate_i$, $accessibility_{ij}$, $substitutes_i$)

$BEACH_j$ = a set of beach characteristics for $beach_j$

Each of the variables in the above expressions is described in the remainder of this subsection. The following two subsections (ii. and iii.) discuss the data and estimation procedures used.

Population. Population is obviously a primary variable explaining recreational activity, and is included in both the gravity model and the estimation of an attractiveness index. The population of each California county (plus six subareas within Los Angeles County) is treated as a separate origin zone i:

P_i = population of origin zone i

Participation rates. Residents of coastal counties have more opportunity to participate in coastal recreation activities than do inland residents. In addition, activity participation rates were found in the 1980 California Parks and Recreation Survey to differ between Northern and Southern California, and according to several socioeconomic characteristics: age, income, ethnicity, sex, occupation and education. Composite participation rates for each county were constructed based on the county's location and distribution of socioeconomic variables in 1980.

$$R_i = B_i \times f(K_{mi})$$

where

R_i = the composite participation rate for $county_i$

B_i = the base rate for $county_i$, in turn a function of the county's location

K_{mi} = weighting factors for the m socioeconomic attributes for county i

Accessibility. Instead of using a simple measure of distance or travel-time to indicate accessibility, we use a function of travel time. This function was estimated from data from the 1980 California Parks and Recreation Survey, and is the same function that is used in the gravity model, and is discussed in the section on the distance-decay function, above. Basically, the function estimates the probability that people will drive different distances to recreate.

$$F_{ij} = c \cdot e^{-(a^2 \cdot (D_{ij} - b)^2)}$$

where

F_{ij} = "friction factor" or accessibility measure between origin i and destination j

D_{ij} = travel times between i and j

a,b,c = parameters estimated by the California Department of Parks and Recreation from their survey data.

Because the exponent of e is always negative, once $D_{ij} \geq b$, F_{ij} declines with longer travel times, the D_{ij}'s.

Substitution. In theory, the more sites a recreationist can choose from, the lower the probability that he will attend any one site, if all else is equal. The gravity model accounts for this possibility of substitute sites by allocating trips to all sites simultaneously. In the gravity model the more sites available to each origin zone, the fewer trips from that zone will be allocated to any one site.

We also account for substitutes in our estimation of attendance as a function of origin and destination attributes and of distance. We do so by creating an index of available substitutes that accounts for not only the number of available substitutes but also the travel time to those substitutes.

For each origin i, we sum the friction factors (F_{ij}) to all destinations j. This total is an index of accessibility of substitutes available to that origin. The greater the index the more accessible the substitutes.

The index S is written:

$$S_i = \sum_j F_{ij}$$

where

S_i = index of substitutability for site i

F_{ij} = friction factor from origin i to destination j

The combined proximity function is:

$$\text{PROXIMITY}_j = \sum_i \frac{P_i \cdot R_i \cdot F_{ij}}{S_i}$$

This specification produces a measure of the potential use of site j. The $PROXIMITY_j$ variable is directly proportional to nearby populations, P_i, the populations' participation rate, R_i, and their propensity to travel to site j, F_{ij}. The measure is inversely proportional to the number and distance of substitute sites, S_i.

Beach characteristics affecting attendance are: the aesthetic quality of the beach, its pedestrian accessibility, its size, whether it is a state or federal beach as opposed to city, county or private beach, and whether or not the beach is located in a metropolitan area. Each beach variable is a separate independent variable in the equation explaining beach attendance.

Aesthetic Quality. The aesthetic quality index for each beach is based on its numerical aesthetic rating in the Granville Corporation's resource inventory of the California coast. In the Granville Study, each section of coastline was rated by landscape architects according to the variety, harmony, and distinctiveness of the land formation and shoreline as well as sounds and smells. The ratings range between 18 and 100. The natural logarithms of the aesthetic ratings were used as explanatory variables, $\ln (Aest_j)$, where $Aest_j$ is the aesthetic rating of beach j.

Pedestrian Accessibility. The pedestrian accessibility variable indicates whether recreationists must take a path or stairway to the beach. This variable is a dummy variable, taking the value of 1 when parking is adjacent to a beach and the value 0 when a beach-goer must take a path or stairway. Because the pedestrian accessibility variable sometimes takes a zero value, it is not converted to logarithms. The variable for each beach j is:

$Ped_j = 1$, if parking is adjacent to a beach;

$Ped_j = 0$, if not.

Beach Size. The beach size variable is measured by ocean frontage. The beach size variable is continuous and enters the attendance equation as a natural logarithm:

$\ln (Beach_j)$, where

$Beach_j$ is the ocean frontage of beach j.

State Beach. This is a dummy variable indicating which agency administers a beach and collects attendance data. The variable is a proxy for several hard-to-quantify differences between state and local beaches, including method of counting attendance (state beaches use traffic counts while most local beaches rely on lifeguard estimates), prevalence of facilities, and access to statewide publicity networks. State and federal beaches were placed into one group and local and a few privately owned beaches open to the public into another. The variable is:

$State_j = 1$, if beach j is state or federal;

$State_j = 0$, if beach j is local or private.

Metropolitan Location. The metro variable indicates whether the beach is located in a city with a population over 50,000. It is thought that in urban areas there are substantial numbers of beach visits facilitated by the location of a beach near large numbers of homes and businesses. The gravity model may fail to explain a sufficiently large number of visits because the large origin zones (counties) may obscure the fact that many people can work or live very near a beach. This variable is also a dummy:

$Metro_j = 1$, if beach j is located within a city of 50,000 people or more;

$Metro_j = 0$, if not.

OCS Development. Substantial study resources were spent trying to identify whether the development of OCS platforms was associated with changes in beach attendance. The "OCS" variable is reported here and discussed in "Section iii, Estimation of the Beach Attendance Model" because its analysis was a central study effort. As explained in that section, the OCS variable is not included in the equation used to estimate beach attendance because the results of the regression analysis are not sufficiently convincing of a relationship between OCS platform development and beach attendance.

Other variables that were tested and rejected as explanatory variables included air and water temperature, number of cooling-degree-days, the existence of onshore oil and gas development, freeway accessibility, and separate variables indicating the number and distance of the offshore oil platforms.

ii. Data for Beach Attendance Model

This section documents the data source for each variable in the beach attendance model.

Attendance: The fiscal year 1979/80 was used for attendance data to correspond to the survey data used to determine participation rates. Attendance figures for State maintained beaches were collected from the California Department of Parks and Recreation's annual statistical reports. The attendance figures for city and county maintained beaches were collected from their respective jurisdictions. Attendance was also collected for the federally-maintained beaches within Point Reyes National Seashore and the Golden Gate National Recreation Area. There were 111 California coastal beaches with attendance data available for the fiscal year 1979/80.

PROXIMITY: The population figures were obtained from the California Department of Finances and SCAG. Participation rates were obtained from the California Parks and Recreation gravity model data base. For the accessibility and substitution portion of the PROXIMITY variable, travel times were obtained from the Parks and Recreation gravity model data base. Travel-times between the newly created zones within Los Angeles County and the coastal geopieces were estimated such that the average of travel-times for the new zones was approximately equal to the travel-time for the old zone from which they were created.

Aesthetic: The aesthetic rating for each beach is the Granville Report rating for the segment of the coastline containing the beach. These ratings were developed in a 1981 study of the California coastline in which each coastal segment was rated by landscape architects. The landscape architects developed a rating system based on the variety, harmony, and distinctiveness of coastal segments. The ratings take manmade structures and modifications into account, including highways, buildings, industrial facilities and offshore oil platforms.

Inclusion of offshore oil platforms in the aesthetic rating is appropriate for the beach attendance explanatory equation used in this report.

However, such an aesthetic rating is inappropriate for the explanatory models that contain a variable indicating offshore platforms. Because the Granville ratings take into account visible offshore oil development evident in 1981, the aesthetic ratings therefore had to be adjusted to avoid double counting. The effects of offshore oil development should only be contained in the oil variable, and not also in the aesthetic variable. To remove the effect of oil development from the Granville aesthetic rating, the ratings for 32 beaches were regressed against their respective oil variable values. As expected, the OCS development that existed in 1980 had a significant negative impact on the aesthetic rating. The estimated coefficient on the oil variable is -7.9397 with a t ratio of -2.72, which is significant at the .01 level. The estimated coefficient of this regression times the oil variable value was used to adjust the original aesthetic rating. Thus, beaches with existing oil development in 1980 received a higher adjusted aesthetic rating. This adjusted aesthetic rating was used in the explanatory models containing an "oil" variable.

Pedestrian Accessibility: Data on parking areas and pathways or stairs to beaches was collected from the California Coastal Access Guide, published by the California Coastal Commission. This reference indicates whether it is necessary to take a path or trail to reach the beach as opposed to direct access from the parking area.

Beach Size: The California Department of Parks and Recreation has published this information for all of the state-owned beaches. The length of beach for the federal, county and city beaches was collected from the relevant agency, where possible, or estimated from maps.

State Beach: CDPR statistical reports were used to determine which agency administers various beaches. Most state-owned beaches in Los Angeles County, for example, are administered by the county and are therefore rated as county beaches. In our analytical data set of 111 beaches, 73 are state or federal and the rest are county or city.

Metro: Populations of cities containing beaches in our sample were obtained from the U.S Census Bureau. If the beach was within or adjacent to a city with a population greater than 50,000, it was considered to be a metropolitan area beach.

Oil: The exact locations of the oil platforms were obtained from MMS, NOAA charts of the California coast and the State Lands Commission. Latitude and longitude readings were then made for each beach and each oil platform. An algorithm was constructed to determine the distance, $dist_{ij}$, from each beach i to each platform j. The oil visibility variable, O_i, for each beach i was then constructed by taking the sum of the reciprocals of the distances for all platforms within 15 miles of the beach, including those in state waters. The cut off distance of 15 nautical miles was estimated by determining the maximum distance at which people on the beach could see the upper deck of a platform, under conditions of good visibility. The maximum distance is represented by the following equation:

$$D = 1.144 \left(\sqrt{h_i} + \sqrt{h_j} \right), \text{ where}$$

D = maximum distance of visibility, in nautical miles, between two objects on the earth's surface, i and j

h_i = height of observer i above sea level

h_j = height of object j above sea level

The upper deck of platforms Irene and Independence are both 83' above sea level (A.D. Little, 1985). If we assume that this platform height is typical of platforms and that a typical observer on the beach is 15 feet above sea level, the maximum distance at which a platform is visible is 14.85 nautical miles:

$$1.144 \times (\sqrt{15} + \sqrt{83}) = 14.85 \text{ miles.}$$

The inverse function of distance implies a diminishing visibility effect with increases in distance. The oil variable equation is:

$$O_i = \sum_j \frac{1}{dist_{ij}} \quad \text{for } dist_{ij} < 15, \text{ where}$$

O_i is a variable reflecting the number and proximity of oil platforms visible from beach i

$dist_{ij}$ is the distance, in nautical miles, between beach i and platform j

In calculating this variable, line of sight was determined using the NOAA charts. If a platform's potential visibility was blocked by coastline, it was not included in the summation. In addition, platforms that were backdropped by industrial development were also excluded. This situation only occurs in the Long Beach Harbor area. For a number of beaches in this area, oil platforms blend in with vessel superstructures and cranes used to offload containers. In sum, beaches with no visible platforms within 15 miles have an oil value of zero. Positive oil values indicate one or more visible platforms within 15 miles of the beach.

Data used in estimating the beach attendance equation is shown in Table 3-10. The table lists the beach name, attendance, proximity variable, length of beach, original aesthetic rating, revised aesthetic rating, the pedestrian access, state beach and metro dummy variables, and the oil variable. The 111 beaches in Table 3-10 are those used in the statewide cross-section estimation.

iii. Estimation of the Beach Attendance Model

The following hybrid natural logarithmic functional form was used in the ordinary least squares estimation (OLS) of factors affecting beach attendance.

$$y_i = X_{1i}^{B_1} X_{2i}^{B_2} \ldots X_{ki}^{B_k} e^{B_{k+1} X_{k+1i}} \ldots e^{B_{k+m} X_{k+mi}} e^{u_i} \quad \text{or}$$

$$\ln y_i = \sum_k B_k \ln X_{ki} + \sum_m B_m X_{mi} + u_i$$

TABLE 3-10

CHARACTERISTICS OF CALIFORNIA BEACHES: 1979-1980

BEACH NAME	1979-1980 ATTENDANCE	PROXI-MITY	BEACH-FEET	ORIGNL AESTHC	REVSD AESTHC	PEDSTRN ACCESS	STATE	METRO	OIL
DEL NORTE	38,280	77	38280	64	64	0	1	0	0.00
PRAIRIE CREEK	288,941	214	11800	91	91	0	1	0	0.00
DRY LAGOON	113,731	214	31900	67	57	0	1	0	0.00
TRINIDAD	48,859	214	8600	67	57	0	1	0	0.00
SINKYONE	4,579	204	29844	81	81	0	1	0	0.00
WESTPORT UNION	48,577	153	17310	95	95	0	1	0	0.00
MACKERRICHER	673,944	163	41187	77	77	1	1	0	0.00
JUG HANDLE	36,098	163	7400	77	77	0	1	0	0.00
RUSSIAN GULCH	67,071	163	7630	77	77	0	1	0	0.00
MENDOCINO	543,812	163	10000	78	78	1	1	0	0.00
VAN DAMME	127,885	163	1700	78	78	1	1	0	0.00
NAVARRO	14,600	105	3000	60	60	1	0	0	0.00
MANCHESTER	60,991	105	11870	69	69	0	1	0	0.00
FORT ROSS	143,075	1166	5000	[illegible]	[illegible]	0	1	0	0.00
SONOMA COAST	1,009,575	1166	58428	[illegible]	[illegible]	[illegible]	1	0	0.00
SALT POINT	87,524	1166	21351	[illegible]	[illegible]	[illegible]	1	0	0.00
WESTSIDE	144,324	1166	10550	[illegible]	[illegible]	[illegible]	1	0	0.00
DORAN CITY	186,882	1166	10560	[illegible]	[illegible]	[illegible]	0	0	0.00
PT REYES	,427,418	1888	180114	[illegible]	[illegible]	[illegible]	0	0	0.00
TOMALES BAY	70,094	1888	12900	[illegible]	[illegible]	[illegible]	1	0	0.00
TENNESSEE	373,101	3183	1040	74	74	[illegible]	1	0	0.00
RODEO	1,711,240	3183	2640	74	74	[illegible]	1	0	0.00
BAKER	781,511	3471	1840	[illegible]	[illegible]	[illegible]	1	0	0.00
LANDS END	3,418,151	3471	1040	[illegible]	[illegible]	[illegible]	1	0	0.00
OCEAN BEACH	1,188,000	3471	24188	[illegible]	[illegible]	[illegible]	1	0	0.00
THORNTON	140,000	3075	3150	[illegible]	[illegible]	[illegible]	1	0	0.00
GREYWHALE COVE	15,515	3075	380	[illegible]	[illegible]	[illegible]	1	0	0.00
MONTARA	109,830	3075	4000	[illegible]	[illegible]	[illegible]	1	0	0.00
FITZGERALD	93,578	3075	15840	[illegible]	[illegible]	[illegible]	1	0	0.00
HALF MOON BAY	1,177,799	3075	4419	[illegible]	[illegible]	[illegible]	0	0	0.00
SAN GREGORIO	383,014	3075	4322	[illegible]	[illegible]	[illegible]	1	0	0.00
POMPONIO	131,111	3075	[illegible]	[illegible]	[illegible]	[illegible]	1	0	0.00
PESCADERO	307,881	3075	7700	[illegible]	[illegible]	[illegible]	1	0	0.00
BEAN HOLLOW	201,818	3075	[illegible]	[illegible]	[illegible]	[illegible]	1	0	0.00
ANO NUEVO	88,418	3075	[illegible]	[illegible]	[illegible]	[illegible]	1	0	0.00
NAT'L BRIDGES	401,815	2204	37830	64	64	[illegible]	1	0	0.00
TWIN LAKES	612,423	2204	5000	64	64	[illegible]	1	0	0.00
NEW BRIGHTON	[illegible]	2204	5308	[illegible]	[illegible]	[illegible]	1	0	0.00
SEACLIFF	505,505	2204	7000	[illegible]	[illegible]	[illegible]	1	0	0.00
MANRESA	838,885	2204	6000	[illegible]	[illegible]	[illegible]	1	0	0.00
SUNSET	836,881	2204	20001	[illegible]	[illegible]	[illegible]	1	0	0.00
ZMUDOWSKI	183,881	1881	9124	[illegible]	[illegible]	0	1	0	0.00
MOSS LANDING	603,768	1881	4730	[illegible]	[illegible]	[illegible]	1	0	0.00
SALINAS RIVER	333,888	1881	8400	[illegible]	[illegible]	[illegible]	1	0	0.00
CARMEL RIVER	384,110	1881	8100	[illegible]	[illegible]	[illegible]	1	0	0.00
POINT LOBOS	281,944	[illegible]	13777	[illegible]	[illegible]	[illegible]	1	0	0.00
JULIA P BURNS	[illegible]	[illegible]	11900	[illegible]	[illegible]	[illegible]	1	0	0.00
W.R. HEARST	207,584	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1	0	0.00
SAN SIMEON	388,888	[illegible]	19700	[illegible]	[illegible]	[illegible]	1	0	0.00
MORRO STRAND	155,208	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1	0	0.00
ATASCADERO	[illegible]	1384	[illegible]	[illegible]	[illegible]	[illegible]	1	0	0.00
MORRO BAY	711,788	1384	[illegible]	[illegible]	[illegible]	[illegible]	1	0	0.00
MONTANA DE ORO	220,428	1384	19200	[illegible]	[illegible]	[illegible]	1	0	0.00
PISMO	1,808,151	1384	[illegible]	[illegible]	[illegible]	0	1	0	0.00
GAVIOTA	180,882	2116	27500	[illegible]	68	[illegible]	1	0	0.00
REFUGIO	180,043	2116	14100	[illegible]	[illegible]	[illegible]	1	0	0.00
EL CAPITAN	[illegible]	[illegible]	9400	[illegible]	[illegible]	[illegible]	1	0	0.00
LEADBETTER	1,050,500	[illegible]	13750	[illegible]	[illegible]	[illegible]	0	0	0.00
CARPENTERIA ST	373,551	3808	4115	65	[illegible]	0	1	0	[illegible]
RINCON	61,640	5761	2640	51	[illegible]	0	0	0	[illegible]
HOBSON	13,880	5761	1849	[illegible]	[illegible]	1	0	0	[illegible]
FARIA	17,000	5761	2640	[illegible]	[illegible]	1	0	0	[illegible]
EMMA K WOODS	141,888	6559	14440	[illegible]	[illegible]	[illegible]	1	0	0.00
SAN BUENAVENT.	970,129	6559	11630	60	40	[illegible]	1	1	0.40
MCGRATH	168,368	6559	10445	54	54	[illegible]	1	0	0.00
POINT MUGU	601,603	7366	19224	93	91	0	1	1	0.00
LEO CARRILLO	673,330	9054	10104	79	79	[illegible]	1	0	0.00
ZUMA	7,125,245	9054	10560	79	79	[illegible]	0	0	0.00
CORRAL	409,400	9054	2376	74	74	[illegible]	0	0	0.00

TABLE 3-10

CHARACTERISTICS OF CALIFORNIA BEACHES: 1979-1980

BEACH NAME	1979-1980 ATTENDANCE	PROXI-MITY	BEACH-FEET	ORIGNL AESTHC	REVSD AESTHC	PEDSTRN ACCESS	STATE	METRO	OIL
MALIBU	569,016	9054	2950	74	74	1	0	0	0.00
TOPANGA	610,450	9054	6336	74	74	1	0	0	0.00
WILL ROGERS	4,099,903	9054	15675	82	82	1	0	1	0.00
SANTA MONICA N	7,742,766	10671	8764	82	82	1	0	1	0.00
SANTA MONICA S	9,099,334	10671	6072	82	82	1	0	1	0.00
VENICE	4,828,074	10671	14500	70	70	1	0	1	0.00
DOCKWEILER	1,720,343	10671	11346	45	45	0	0	1	0.00
MANHATTAN	2,176,187	10671	10950	72	72	1	0	1	0.00
HERMOSA	3,626,750	10671	8450	72	72	1	0	1	0.00
REDONDO	3,692,144	10671	7030	72	72	1	0	1	0.00
TORRANCE	1,860,200	10671	3960	72	72	1	0	1	0.00
ABALONE COVE	155,279	10170	6336	93	93	0	0	0	0.00
CABRILLO	3,162,625	10762	4118	46	46	1	0	1	0.00
BOLSA CHICA	2,239,278	12365	27607	48	59.9	1	1	1	1.50
HUNTINGTON CITY	4,950,000	12365	26400	48	56.7	1	0	1	1.10
HUNTINGTON ST	2,293,380	12365	10900	48	54.2	1	1	1	0.78
NEWPORT	10,740,000	12365	30360	98	99.5	1	0	1	0.19
DOHENY	594,296	11091	6567	56	56	0	1	0	0.00
SAN CLEMENTE ST	632,455	11091	6000	56	56	0	1	0	0.00
SAN ONOFRE	722,701	6916	24850	45	45	0	1	0	0.00
CARLSBAD	1,193,677	8180	5428	81	81	1	1	0	0.00
SO. CARLSBAD	795,238	8180	13434	57	57	1	1	0	0.00
LEUCADIA	426,485	8180	5380	84	84	0	1	0	0.00
SEASIDE GARDENS	86,670	8180	600	84	84	1	0	0	0.00
MOONLIGHT	1,[illegible]	8180	1820	75	75	1	1	0	0.00
SEACLIFF	76,700	8180	600	84	84	0	0	0	0.00
SAN ELIJO	462,192	8180	9130	84	84	1	1	0	0.00
CARDIFF	1,026,566	8180	5919	84	84	1	1	0	0.00
TIDE	55,090	8180	600	84	84	1	0	0	0.00
SOLANA	42,295	8180	2640	84	84	0	0	0	0.00
TORREY PINES	842,100	8180	6641	83	83	0	1	0	0.00
BLACK'S	513,175	8180	4486	95	95	0	0	1	0.00
SCRIPPS	259,472	8180	1478	95	95	1	0	1	0.00
LA JOLLA SHRS	2,699,349	8180	2904	95	95	1	0	1	0.00
WINDANSEA	165,305	7654	1690	88	88	1	0	1	0.00
NORTH PACIFIC	317,225	7654	1110	88	88	1	0	1	0.00
SOUTH PACIFIC	1,916,865	7654	2218	88	88	1	0	1	0.00
MISSION	2,754,080	7654	10685	65	65	1	0	1	0.00
SOUTH MISSION	612,767	7654	880	65	65	1	0	1	0.00
OCEAN	2,101,354	7654	2640	86	86	1	0	1	0.00
SILVER STRAND	395,607	7654	23500	57	57	1	1	0	0.00
BORDER FIELD	114,916	7654	6040	63	63	0	1	0	0.00

where

y_i = attendance

B_{k+m} = coefficients to be estimated

X_{ki} = independent explanatory variables, such that X_{ki} is never zero

X_{mi} = independent explanatory variables, such that some $X_{mi} = 0$

u_i = error term

The log linear functional form was specified based on theoretical considerations. Most importantly, this functional form assures declining marginal effects of each independent variable. In addition, by measuring attendance in natural logarithms the range of the dependent variable is reduced, which is important because the beach attendance figures vary from 14,000 to over 21 million. This functional form also implies that the explanatory variables have a multiplicative effect on attendance. However, because one attribute of logarithms is that the log of zero is undefined, any variable that takes a zero value cannot be transformed to logarithms. The oil variable, therefore, as well as the pedestrian accessibility, state and metro dummy variables were not transformed to logarithms because they have observations with zero values.

The OLS regression results are reported in below. Each of the variables is listed along with its estimated coefficient and t ratio. PROXIMITY, beach aesthetics, beach length, being a state beach, metropolitan location, and pedestrian accessibility all positively affect attendance, as expected. In addition, all of the variables are shown to significantly affect attendance. For regressions with 99 degrees of freedom a t ratio greater than 1.66 is significant at the 10 percent level. These results indicate that all of these variables are appropriate as explanatory variables in models predicting beach attendance.

OLS Regression: Factors Affecting Beach Attendance

Variable	Estimated Coefficient	T-Ratio 99 df
ln PROXIMITY	.48852	6.58***
ln aesthetic rating	1.23350	3.35***
ln beach feet	.52126	6.48***
state beach	.70019	3.16***
pedestrian accessibility	.34328	1.87*
metropolitan location	1.83050	8.17***
intercept	-8.96740	-4.42***

Adjusted R^2 = .6799
106 Observations

* Significant at 10 percent confidence level.
** Significant at 5 percent confidence level.
*** Significant at 1 percent confidence level.

These regression results are used in the overall model in two ways:

First, the beach attendance regression provides a method for estimating attendance at the 92 beaches that are missing attendance data. The regression equation explains 68 percent of the variance in attendance for the beaches in the data set, supplying a relatively accurate means for estimating missing data.

Second, the regression equation provides the driver for changing beach attendance in response to OCS-induced changes in beach characteristics. Any changes in a beach's length or aesthetic rating can be directly addressed by the model because such changes will alter an explanatory variable in the attendance equation, and thereby affect the attractiveness index.

This study extensively explored the relationship between beach attendance and offshore oil platforms to try to determine whether any association existed. It was intended that if such an association were found, a variable representing the presence of offshore oil platforms would also enter the regression equation as an explanatory variable. However, as will be explained shortly, the existence of such an association was not determined with sufficient confidence to warrant including it in the explanatory model.

The model may still be used to determine the effects from a subjectively estimated change in beach attendance. The user provides a percent estimate of beach attendance change, then the model will indicate the implications of that change on the local tourist economy and on consumer surplus (to be discussed in later sections).

Before turning to the creation of the attractiveness indices for the beach activities, we summarize the beach attendance estimations that used the oil variable. Although it is not used in the final regression equation, the oil variable was the focus of much effort in the analysis of the impacts of OCS development on tourism and recreation.

Estimations on the Oil Variable. To attempt to isolate the impacts of OCS development on attendance, two data bases of beach attendance and factors affecting attendance were compiled. The first was a cross-section time series of Southern California beaches. The cross-section of beaches included 27 beaches from Santa Barbara County south to San Diego County, since all the fixed oil platforms in California are located along this portion of the coast. Data on attendance and other variables were from fiscal year 1975-76 through 1983-84, providing 27 beaches x 9 years or 243 observations. Data are available for earlier years for state maintained beaches, but comparable data for county and city beaches are sparse and of questionable validity. This pooled data for 27 beaches provided observations on beaches that do not have visible oil rigs, beaches that had visible oil rigs throughout the time series, and beaches that had oil platforms installed during the time period.

A second beach attendance data set was also compiled. This data set contained data for a single year, the 1979-80 fiscal year, corresponding to the period during which the CDPR recreation survey was made. The data include observations of attendance and beach characteristics at 111 beaches statewide, and was used for cross-sectional regressions.

Both data sets included variables to capture the visual effect of oil platforms. Several forms of the "oil" variables were tried, including:

ON_i = the number of platforms within 15 miles of beach i

OD_i = the distance from beach i to the nearest platform

$$OIL1 = \sum_j \frac{1}{d_{ij}}, \text{ where } d_{ij} = \text{the distance from beach i to platform j}$$

$$OIL2 = \sum_j \frac{1}{d_{ij}2}$$

$$OILB = 1 - \sum_j \frac{W}{2\pi D_{ij}} = 1 - \sum \frac{.03}{2*3.14*D_{ij}} = 1 - .004777 \times OIL1$$

where

W = width of a typical platform
$2\pi D_{ij}$ = viewer's horizon

OIL1, the sum of the reciprocals of the distance from the beach to each platform, overall demonstrated the highest explanatory power (the highest t-statistic). All forms of the oil variable are highly correlated, so to avoic multicollinearity only one at a time could be used in the regressions.

Our apriori expectations were that OCS platforms and beach attendance would either exhibit a small, negative relationship or not be related at all. This expectation was based on the judgement formed by professional landscape architects as described in the Granville Report, POCS 81-5, which concludes that introducing OCS platforms would reduce the aesthetic rating at most beaches. Furthermore, the work in POCS 81-5 as well as the analysis in this study shows that aesthetic rating is a significant explainer of beach attendance. Finally, it is apparent that introducing an industrial structure in a natural environment may reduce some people's enjoyment of that environment. The question is how many people, if any, would consequently divert their recreation to elsewhere.

Several approaches were tried in this study to identify whether OCS platforms are associated with beach attendance and to quantify that association, if it exists. Cross-section (CS) analysis, cross-section time-series (CSTS) analysis, and CSTS analysis using dummy variables for all purely time-dependent or beach-dependent variables were all used. Time-series (TS) analysis was also used on a few beaches that were near OCS platforms whose installations were made during the period covered by the data.

The CSTS approach shows a strong <u>positive</u> relationship between OCS platforms and beach attendance, which we find implausible based on apriori expectations. The CSTS approach using dummy variables for each OCS platform installed during the period for which we have data provides more detailed information. However, this dummy variable analysis reveals widely differing coefficients on each installation, with both the sign and the magnitude of the coefficients inconsistent among observations.

We infer from these results that the positive overall relationship between OCS platforms and beach attendance shown in the CSTS approach is probably a spurious result. This result probably stems from some important explanatory variables missing from the specification.

The TS approach provides more evidence that the results of the OCS platform impact analysis over time are questionable. In a TS analysis of five beaches where OCS platforms were installed during the period for which we have data, we again found widely varying results. The TS results imply that a platform installation 3 miles offshore is associated with a 41 percent <u>reduction</u> in beach attendance at one beach and a 38 percent <u>increase</u> in attendance at another beach. Neither extreme is credible, and to us these results reflect missing explanatory variables in the TS specification and too few observations.

The CS approach yields results that show some consistency, especially in analyses with relatively more observations. The CS approach was used on the statewide data set that included 111 beaches. The CS was also applied to two subsets of the statewide data set. The first subset consisted of 56 beaches in Southern California, 16 of which had oil platforms offshore. The second was a subset of the first, and included the 27 Southern California beaches for which nine years' observations were available. Nine of these beaches had platforms offshore.

The statewide CS results show a statistically significant association between OCS platforms and beach attendance. The results shown below indicate all explanatory variables in this specification are statistically significant at the 10 percent level or higher. The implication of the coefficient on the OCS measure is that adding one platform 3 miles from a beach would reduce attendance by 12 percent.

OLS Regression: Factors Affecting Beach Attendance
(dependent variable = log of attendance)

Variable	Estimated Coefficient	T Ratio
intercept	-9.3177	-3.60***
ln proximity	.6333	5.67***
ln aesthetic rating	1.0130	2.24**
ln beach feet	.5900	6.83***
ln distance to freeway	- .1477	-1.93*
OIL1	- .3810	-1.83*
pedestrian accessibility	.4583	2.25**
metro location	1.2869	5.34***
north/south dummy	.7388	2.31**

Adjusted R square = .6054

107 Observations

* indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level

Applying the CS method to the subset of 56 Southern California beaches, which includes all beaches with oil platforms offshore, results in a smaller coefficient on the OIL1 variable. The coefficient becomes -.170, which implies a 5.5 percent decline in beach attendance associated with one platform at 3 miles. However, the t-statistic is only .86, indicating only 60 percent confidence that the coefficient is different from zero.

When the CS method is applied to the smallest sample of 27 beaches, the sign on OIL1 reverses, indicating a positive association between OCS platforms and beach attendance. We consider this result spurious, based on its conflict with our expectations of a zero or small negative association.

Our synthesis of these various results leads us to the following conclusions:

1. The statewide CS analysis provides some evidence, although inconclusive, of a negative association between OCS platforms and beach attendance.

2. However, because of low t-statistics on the CS that includes the 56 beaches in Southern California, and because of the conflicting and erratic results in the CSTS and TS estimations, we cannot be confident that the negative association is significantly different from zero. In simpler terms, we are not sure that OCS platforms actually do adversely affect beach attendance.

3. Because our results are ambiguous we believe it inappropriate to program them into a beach attendance model that produces detailed quantitative impact results.

Other Variables Not Included in Final Model: Several other variables were included as explanatory variables in various specifications of the attendance model. To assist future researchers, variables that would seem to affect attendance, but did not prove significant are discussed briefly.

Vehicle accessibility, as measured by the inverse of the distance to the nearest freeway off-ramp, should affect attendance. If a beach can be accessed by a main traffic artery, the attendance should be higher than at a beach without a main traffic artery, all else held equal. However, the difference in Northern and Southern California freeway systems makes this variable insignificant in explanatory power, when observations from both the North and South are used. In the estimation of factors affecting Southern California beach attendance, the freeway accessibility variable, however, did prove to be significant. The size of the beach's parking facility also affects attendance because it reflects potential parking availability. However, no consistent data set is available because adjacent on-street parking would have to be includec to accurately measure parking capacity in the metropolitan areas.

Weather obviously affects beach attendance, but it is difficult to obtain the pertinent local data. The weather stations are not strategically located for our data needs. Nevertheless, attempts were made to collect data on degree cooling days and average air temperature for the inland population centers as well as at the beaches. None of these weather measures was found significant in our estimations of factors affecting beach attendance.

Beach water temperature was also entered as a potential variable affecting attendance. Water temperature data for 31 coastal areas was collected from National Oceanographic Data Center reports. This variable was never found to significantly affect attendance.

iv. Development of Attractiveness Indices for the Beach Related Activities

The water enhanced and water dependent attraction of a geopiece can be characterized by the same explanatory variables found significant for beach attendance. Once the explanatory variables for beach attendance are determined, the calculation of a geopiece's attractiveness index can proceed. The beach attendance model is used in two ways. The estimated beach attendance model is first used to predict beach attendance at all of the beaches within a geopiece that are missing actual attendance data. Total beach attendance for a geopiece is then determined by summing over the geopiece's beaches. Second, the attendance model is used to calculate each geopiece's water related attractiveness index. This index is determined by dividing each geopiece's total attendance by its PROXIMITY value. This calculation is based on characteristics of the attendance model and the gravity model. A simplified gravity model is specified:

$$\text{Attendance} = \frac{\text{Attractiveness} * \text{Participation}}{\text{Decay Function}}$$

This equation is similar to our attendance model if the PROXIMITY variable is equivalent to:

$$\text{PROXIMITY} = \frac{\text{Participation}}{\text{Decay Function}}$$

The gravity model can be rewritten as:

$$\text{Attractiveness} = \frac{\text{Attendance}}{\text{PROXIMITY}}$$

Thus, the beach attractiveness index is determined by dividing the estimated attendance of a geopiece by the value of the PROXIMITY variable for the geopiece. Because we can not differentiate beach attendance related to water enhanced activities and beach attendance related to water dependent activities, the same model was used to determine both indices. The beach-related attractiveness indices will not be the same for a geopiece, however, because participation rates differ.

b. Boating Related Attractiveness Index

Our approach to developing an attractiveness measure for boating activities is first to estimate the factors affecting boat registration and then to construct the attractiveness index using the estimated coefficients of the significant factors. We use boat registration as an indicator of boating attractiveness just as we used beach attendance as an indicator of beach attractiveness.

i. Model of Factors Affecting Boat Registration

We hypothesize that boat registration at the county level is a function of the number of available boating facilities and our proximity variable, which incorporates population, participation, accessibility and substitutability. The model is represented:

$$\text{Reg}_c = f\ (\text{Facilities}_c,\ \text{PROXIMITY}_c)$$

where c indicates county c.

We assume OCS development does not affect boat registration and therefore a measure of OCS development is not included in the model. In our model, therefore, boating activities are only affected by oil spills, not offshore platforms.

ii. Data

Registration: Boat registration data for 1984 was obtained from the California Department of Motor Vehicles and was only available at the county level. The number of pleasure boat and the number of rental boat registrations were combined to indicate a county's boat registration. Because we are concerned with ocean boating, only the boat registrations in the coastal counties and the San Francisco Bay area counties of Alameda and Contra Costa were considered.

Facilities: Data on boating facilities was obtained from the California Department of Navigation and Ocean Development. Facilities are measured by the total number of berths, moorings, and dry dock storage available in a county.

Proximity: A proximity value for a county was constructed by taking an average of the county's geopiece proximity values. This calculation was necessary because proximity values are determined at the geopiece level. The boating proximity variable for geopiece j is equivalent to the proximity variable presented in the beach attractiveness section:

$$\text{PROXIMITY}_{jk} = \frac{P_i \cdot R_{ik} \cdot F_{ij}}{S_i}$$

In this case R_{ik} represents boating participation in county i and the other terms are the same as for beach activities; P_i is the population of county i, F_{ij} represents the accessibility of county i to geopiece j, and S_i represents the substitutability of geopieces for county i. The data sources for the components of this variable are the same as for the beach activities proximity variable.

iii. Estimation of the Model

A log linear functional form was again specified for the estimation based on the theoretical considerations of multiplicative and declining marginal effects of the explanatory variables. However, in this estimation the natural log of registration divided by proximity is used as the dependent variable. By using this ratio as the dependent variable, the model directly estimates a county's boating attractiveness index. As illustrated previously, the trip distribution model can be respecified as:

Attractiveness = Attendance/Proximity

In the boating model, attendance is measured by registrations. The statistical model estimated is:

$$\ln(A_c) = \ln(reg_c/Prox_c) = B_0 + B_1\ln(Prox_c) + B_2\ln(Fac_c) + u_c$$

where

A_c = boating attractiveness index for county c;

reg_c = number of registered vessels in county c;

$Prox_c$ = the proximity variable for county c;

Fac_c = boat storage facilities (moorings + berths + dry storage) in county c;

E_n = coefficients to be estimated;

u_c = error term.

The OLS regression results are reported in Table 3-11.

Table 3-11
OLS Regression: Results of Factors Affecting County Level Boat Registration

Independent Variables	Estimated Coefficients	T-Ratio 14 df
ln proximity	-.50115	-3.105**
ln facilities	.37223	1.859*
intercept	.46607	.3448

Adjusted R^2 = .5370
17 observations

* Significant at the 10 percent confidence level.
** Significant at the 1 percent confidence level.

The facilities variable is shown to positively affect attractiveness, and is significant at the 10 percent level. The proximity variable negatively affects attractiveness and is significant at the 1 percent level. This negative relationship suggests that proximity may be acting as a proxy for price. With higher county populations, participation and accessibility, the amount of available per capita coastline declines. The scarcity of coastline can increase charges for the limited boating facilities, thereby depressing boat registration demand.

iv. Determination of the Attractiveness Index

The calculation of a geopiece's boating attractiveness proceeds readily. A geopiece's attractiveness index is the antilog of the predicted value determined by entering a geopiece's facility and proximity values into the above estimated boating attractiveness model.

c. Development of the Fishing Attractiveness Index

Unlike beach and boating activities, there are no currently available indicators of a geopiece's fishing attractiveness. Although fish catch is reported by the California Department of Fish and Game for commercial passengers fishing vessels, the data excludes pier and shore fishing as well as fish catches occurring on private boats. Fishing license application could potentially be used to estimate an attractiveness index. However, only statewide sales are reported by the California Department of Fish and Game.

Due to the lack of relevant data, we are forced to assume all geopieces are equally attractive. All geopieces are given a relative attractiveness weight of one.

The geopiece attractiveness ratings for each of the four activities are reported in Table 3-12.

5. Model Output

The chief output of the gravity model is a projected distribution of trips from each origin county to each destination geopiece. This is stored in a matrix with 63 origins (57 counties plus 6 sections of Los Angeles County) and 49 geopiece destinations. The model produces one such matrix for each of the four activity categories, and for each of those it produces a baseline and an impact matrix ("without-project" and "with-project" conditions). These matrices are key inputs to both subsequent models, the economic effects model and the consumer surplus model. Because of the size of the matrices, however, only the summary vector of total trips to each destination is printed for each activity. These vectors are calculated by summing over origins the values in the trip distribution matrices. Tables 3-13 to 3-15 show examples of the baseline vector, the impact vector, and a vector of the differences. The baseline vector is identical, of course, for all impact scenarios.

The gravity also prints a table of the percentage changes in attendance for negatively-impacted geopieces, shown in Table 3-16. This percentage is based on the baseline attendance for an entire year (i.e. a 10 percent change for half of a year is calculated as a 5 percent change overall).

Furthermore, the gravity model produces a set of summary values of interest in their own right to the analyst. These include tables of attractiveness indices by geopiece and by activity, for the baseline case, as well as the difference in attractiveness for negatively-impacted geopieces. (See Tables 3-17 and 3-18).

C. Economic Effects Model

1. Introduction

This section describes the approaches, methods, and data used to develop the economic effect component of the evaluation system. It provides both an overview of the structure of the economic impact model, as well as a detailed documentation of the specific elements and data values used in the analysis.

The overall structure of the economic effects component is illustrated in Figure 3-11. The economic effects model is linked to the other models by the projections of participation days from the gravity model. These are disaggregated by site (sub-county coastal section), by activity, by duration of stay (day trip or overnight), and by state of origin (California as opposed to out-of-state).

Note that local resident spending is not included in this component of the model system. Local residents' recreation choices and appreciation of chosen activities may be subject to potential impacts from offshore development, but their local recreation spending is not likely to vary significantly as a result of such development. For example, an oil spill which temporarily closes a beach is cause for local residents to substitute other beaches or other recreation activities for the impacted activity. Choice of a different beach is reflected in the gravity

Table 3-12

BASELINE ATTRACTIVENESS INDICES

Geopiece	Boating	Fishing	Beach Act.
3	3.088	1.000	1.455
4	.000	1.000	.958
9	.530	1.000	.565
137	.901	1.000	.861
138	1.332	1.000	.000
140	.098	1.000	1.821
204	.000	1.000	.033
208	.000	1.000	.617
241	.205	1.000	.041
311	.000	1.000	.104
319	8.968	1.000	.780
320	4.267	1.000	1.781
321	4.716	1.000	1.726
322	.000	1.000	.446
325	.000	1.000	.024
326	.000	1.000	.522
327	4.510	1.000	9.186
328	.601	1.000	.952
362	1.383	1.000	1.470
364	1.039	1.000	.000
369	.947	1.000	.049
370	.000	1.000	1.152
371	2.240	1.000	.000
375	1.480	1.000	.000
376	.747	1.000	.854
378	2.054	1.000	.000
381	2.309	1.000	.000
410	.000	1.000	.166
411	1.688	1.000	1.540
413	1.426	1.000	.602
414	1.678	1.000	1.078
420	.000	1.000	.755
421	2.637	1.000	2.649
431	.000	1.000	.019
432	.000	1.000	.040
433a	.159	1.000	.325
433b	1.787	1.000	.433
433c	.000	1.000	.107
435	.000	1.000	.016
437	1.980	1.000	.272
438	.000	1.000	.082
439	.115	1.000	1.553
440a	2.019	1.000	3.313
440b	.000	1.000	.346
440c	2.267	1.000	.488
448	2.056	1.000	2.489
449	1.345	1.000	.348
457	.905	1.000	1.600
458	2.068	1.000	2.057

Table 3-13
BASELINE
Proportion of full year: 1.0000

Total Participation

Geopiece	Pleasure Boating	Sport-Fishing	Beach Activities Water Dep.	Beach Activities Water Enh.
3	5967.	6656.	28203.	83535.
4	0.	28213.	79926.	147879.
9	2888.	10929.	26271.	94296.
137	92477.	157415.	860313.	2117734.
138	250769.	421337.	0.	0.
140	21327.	405848.	4151339.	8667811.
204	0.	172296.	31597.	74516.
208	0.	48498.	200212.	597917.
241	13670.	72626.	34607.	41207.
311	0.	427818.	365829.	328132.
319	13729.	5095.	11534.	36198.
320	21708.	28213.	148589.	274920.
321	27679.	26234.	131729.	275795.
322	0.	15766.	21710.	56301.
325	0.	18505.	2091.	6657.
326	0.	13809.	35485.	116574.
327	37585.	13203.	624247.	2317259.
328	3557.	6496.	38721.	173738.
362	97966.	105893.	978226.	2571626.
364	152478.	311735.	0.	0.
369	97198.	157415.	48961.	120521.
370	0.	365677.	2392568.	5022074.
371	426248.	363735.	0.	0.
375	346078.	464759.	0.	0.
376	145829.	340358.	1676666.	3664879.
378	438242.	396628.	0.	0.
381	532636.	471070.	0.	0.
410	0.	119508.	126735.	347042.
411	237894.	233258.	2049300.	4806430.
413	162851.	209695.	691635.	1558934.
414	149139.	138207.	842255.	2086253.
420	0.	83492.	472598.	606102.
421	175657.	114133.	2470431.	2987975.
431	0.	77974.	15262.	18525.
432	0.	78152.	39156.	44926.
433a	16742.	106002.	435964.	454469.
433b	256385.	153960.	799056.	777524.
433c	0.	216072.	257320.	239925.
435	0.	365604.	58327.	49628.
437	600341.	426624.	1103111.	926196.
438	0.	489235.	362445.	301759.
439	46572.	639757.	8413453.	6709046.
440a	934508.	792839.	21137420.	16322110.
440b	0.	741645.	2074851.	1627850.
440c	1045090.	799068.	3098766.	2399374.
448	1075749.	949990.	17965920.	13511810.
449	601864.	765191.	2075600.	1638990.
457	324420.	553388.	6646034.	5737584.
458	692562.	539807.	7786015.	6641861.

Table 3-14
Project: Northern Santa Barbara County (Pt.Pedernales)

BASELINE PLUS IMPACT
Proportion of full year: 1.0000

Total Participation

Geopiece	Pleasure Boating	Sport-Fishing	Beach Activities Water Dep.	Beach Activities Water Enh.
3	5967.	6656.	28203.	83535.
4	0.	28213.	79926.	147879.
9	2888.	10929.	26271.	94296.
137	92477.	157415.	860314.	2117737.
138	250769.	421337.	0.	0.
140	21327.	405848.	4151344.	8667832.
204	0.	172296.	31598.	74517.
208	0.	48498.	200215.	597925.
241	13670.	72626.	33765.	40204.
311	0.	427818.	365830.	328134.
319	13729.	5095.	11534.	36198.
320	21708.	28213.	148589.	274920.
321	27679.	26234.	131729.	275795.
322	0.	15766.	21710.	56301.
325	0.	18505.	2091.	6657.
326	0.	13809.	35485.	116575.
327	37585.	13203.	624247.	2317261.
328	3557.	6496.	38721.	173738.
362	97966.	105893.	978227.	2571629.
364	152478.	311735.	0.	0.
369	97198.	157415.	48961.	120522.
370	0.	365677.	2392571.	5022084.
371	426248.	363735.	0.	0.
375	346078.	464759.	0.	0.
376	145829.	340358.	1676668.	3664888.
378	438242.	396628.	0.	0.
381	532636.	471070.	0.	0.
410	0.	119508.	126736.	347043.
411	237894.	233258.	2049311.	4806458.
413	162851.	209695.	691643.	1558949.
414	149139.	138207.	842264.	2086273.
420	0.	83492.	472630.	606132.
421	175657.	114133.	2470578.	2988111.
431	0.	77974.	15263.	18526.
432	0.	78152.	39158.	44928.
433a	16742.	106002.	435983.	454485.
433b	256385.	153960.	799087.	777550.
433c	0.	216072.	257328.	239933.
435	0.	365604.	58328.	49629.
437	600341.	426624.	1103132.	926215.
438	0.	489235.	362451.	301764.
439	46572.	639757.	8413553.	6709154.
440a	934508.	792839.	21137630.	16322350.
440b	0.	741645.	2074870.	1627872.
440c	1045090.	799068.	3098792.	2399405.
448	1075749.	949990.	17966030.	13511960.
449	601864.	765191.	2075611.	1639006.
457	324420.	553388.	6646056.	5737624.
458	692562.	539807.	7786034.	6641897.

Table 3-15
Project: Northern Santa Barbara County (Pt.Pedernales)

IMPACT
Proportion of full year: 1.0000

Difference in Participation

Geopiece	Pleasure Boating	Sport-Fishing	Beach Activities Water Dep.	Beach Activities Water Enh.	
3	0.	0.	0.	0.	
4	0.	0.	0.	0.	
9	0.	0.	0.	0.	
137	0.	0.	1.	4.	
138	0.	0.	0.	0.	
140	0.	0.	6.	21.	
204	0.	0.	0.	1.	
208	0.	0.	3.	7.	
241	0.	0.	-842.	-1003.	***
311	0.	0.	2.	3.	
319	0.	0.	0.	0.	
320	0.	0.	0.	0.	
321	0.	0.	0.	0.	
322	0.	0.	0.	0.	
325	0.	0.	0.	0.	
326	0.	0.	0.	0.	
327	0.	0.	0.	2.	
328	0.	0.	0.	0.	
362	0.	0.	1.	3.	
364	0.	0.	0.	0.	
369	0.	0.	0.	0.	
370	0.	0.	3.	11.	
371	0.	0.	0.	0.	
375	0.	0.	0.	0.	
376	0.	0.	2.	9.	
378	0.	0.	0.	0.	
381	0.	0.	0.	0.	
410	0.	0.	0.	2.	
411	0.	0.	11.	28.	
413	0.	0.	8.	15.	
414	0.	0.	9.	21.	
420	0.	0.	31.	30.	
421	0.	0.	148.	136.	
431	0.	0.	1.	1.	
432	0.	0.	2.	2.	
433a	0.	0.	19.	16.	
433b	0.	0.	31.	26.	
433c	0.	0.	8.	7.	
435	0.	0.	1.	1.	
437	0.	0.	21.	20.	
438	0.	0.	5.	5.	
439	0.	0.	100.	108.	
440a	0.	0.	208.	234.	
440b	0.	0.	19.	22.	
440c	0.	0.	27.	31.	
448	0.	0.	118.	149.	
449	0.	0.	12.	16.	
457	0.	0.	23.	40.	
458	0.	0.	19.	37.	

Table 3-16
Project: Northern Santa Barbara County (Pt.Pedernales)

PERCENT OF IMPACT COMPARED TO BASELINE

Geopiece	Pleasure Boating	Sport-Fishing	Beach Activities Water Dep.	Beach Activities Water Enh.
241	.00	.00	-2.43	-2.43

Table 3-17
IMPACT ATTRACTIVENESS INDICES

Project: Northern Santa Barbara County (Pt. Pedernales)

Geopiece	Boating	Fishing	Beach Act.
3	3.088	1.000	1.455
4	.000	1.000	.958
9	.530	1.000	.565
137	.901	1.000	.861
138	1.332	1.000	.000
140	.098	1.000	1.821
204	.000	1.000	.033
208	.000	1.000	.617
241	.205	1.000	.040
311	.000	1.000	.104
319	8.968	1.000	.780
320	4.267	1.000	1.781
321	4.716	1.000	1.726
322	.000	1.000	.446
325	.000	1.000	.024
326	.000	1.000	.522
327	4.510	1.000	9.186
328	.601	1.000	.952
362	1.383	1.000	1.470
364	1.039	1.000	.000
369	.947	1.000	.049
370	.000	1.000	1.152
371	2.240	1.000	.000
375	1.480	1.000	.000
376	.747	1.000	.854
378	2.054	1.000	.000
381	2.309	1.000	.000
410	.000	1.000	.166
411	1.688	1.000	1.540
413	1.426	1.000	.602
414	1.678	1.000	1.078
420	.000	1.000	.755
421	2.637	1.000	2.649
431	.000	1.000	.019
432	.000	1.000	.040
433a	.159	1.000	.325
433b	1.787	1.000	.433
433c	.000	1.000	.107
435	.000	1.000	.016
437	1.980	1.000	.272
438	.000	1.000	.082
439	.115	1.000	1.553
440a	2.019	1.000	3.313
440b	.000	1.000	.346
440c	2.267	1.000	.488
448	2.056	1.000	2.489
449	1.345	1.000	.348
457	.905	1.000	1.600
458	2.068	1.000	2.057

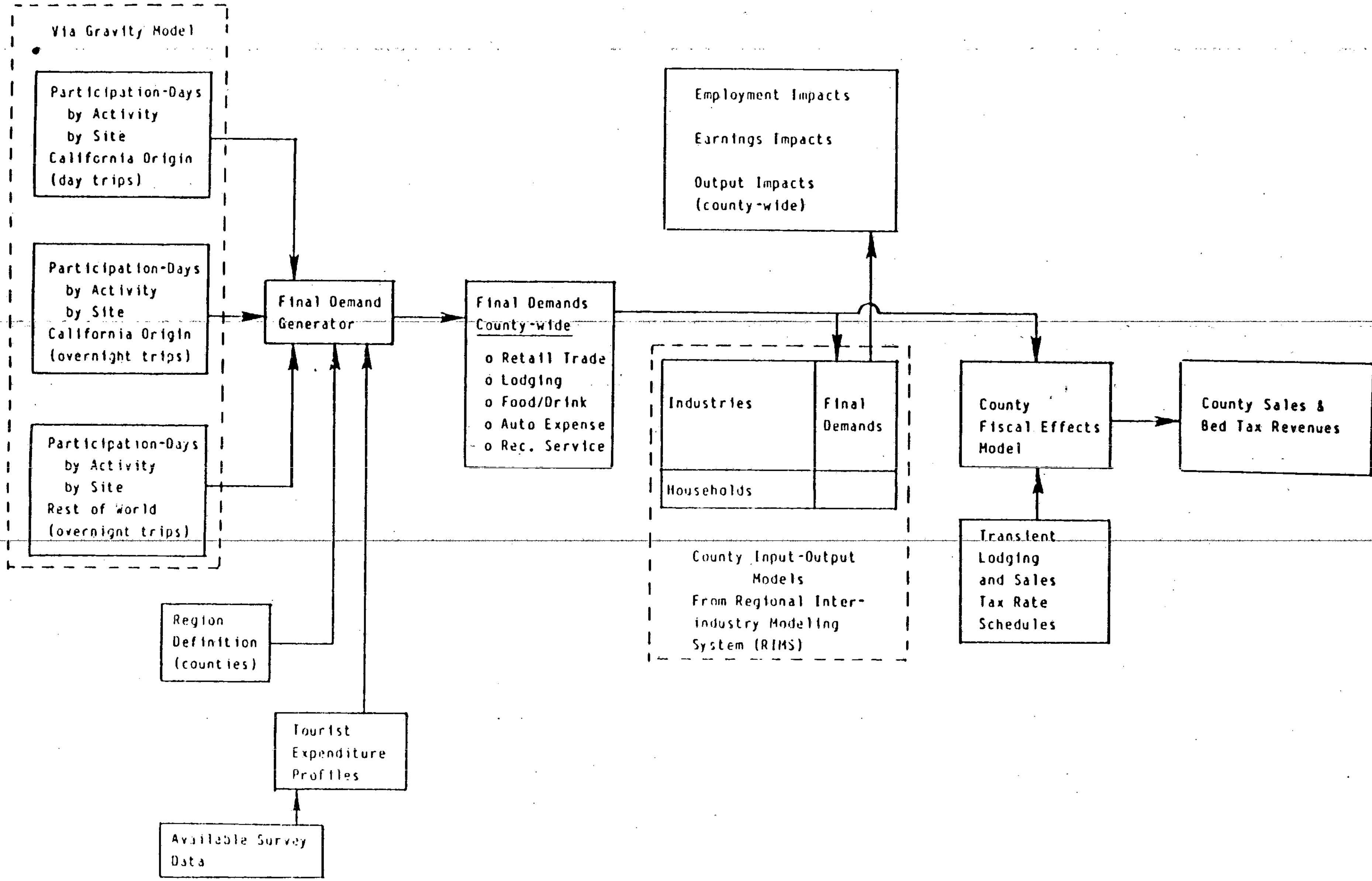
Table 3-18
DIFFERENCE: BASELINE MINUS IMPACT ATTRACTIVENESS

Project: Northern Santa Barbara County (Pt.Pedernales)

Geopiece	Boating	Fishing	Beach Act.
241	.000	.000	.001

Figure 3-11

LOGICAL FLOW OF DATA AND ANALYSIS: ECONOMIC EFFECTS MODEL



model distribution of participant days by location and activity. Residents choosing a different local recreation activity — such as going to the movies or to an inland park — are not likely to reduce their total local spending, and in some cases may actually increase local spending.

Participation-day projections are combined with tourist expenditure profiles to assess the direct spending impacts of participants in the activities included in the analysis. Expenditure profiles are derived from several surveys conducted in California coastal areas between 1973 and 1983. Like the participation-day projections, the spending profiles are specific to activities and to duration of stay. In addition, expenditures relate to specific categories of goods and services purchased (food and beverages, lodging, gasoline, auto services, and so forth). The visitor spending profiles are expressed on a visitor-day basis.

Projected visitor-days are then multiplied by expenditures per day to generate county-level estimates of demands by visitors for local goods and services. The "final demand generator" used to match up the appropriate values and perform the multiplications then passes the data to county-level input-output (I-O) models.

These I-O models are derived from the Regional Interindustry Modeling System (RIMS) based on research conducted by the Bureau of Economic Analysis (See Cartwright, et al., 1981). RIMS, as maintained by Applied Economic Systems, Inc., is an independently derived version of the RIMS II method originally developed by BEA. It is a secondary-data approach to developing regional input-output models that is very similar to RIMS II. The most recent (1977) U.S. technical interindustry relationships and (1982) County Business Patterns data were used to estimate I-O models for the California coastal counties.

A matrix of input-output multipliers for each county, showing the direct, indirect, and induced (total) requirements for output from each major industrial sector, is maintained in the economic impact component. When these multipliers are applied to the direct spending estimates produced by the final demand generator, the result is a projection of the total output (sales or production) consequences of initial visitor expenditures. Using labor and earnings coefficients specific to each sector, these output effects are translated into county jobs and income impacts attributable to visitor outlays.

Fiscal relationships are then used to assess the local sales and transient occupancy (bed) tax revenues associated with this tourism activity. The principal revenue bases are lodging expenditures (for the bed tax) and retail-service spending (for the sales tax). The model derives both direct sales tax collections (that is, revenues received from the tourist expenditures themselves) as well as indirect sales tax receipts (revenues from the indirect sales attributable to initial visitor outlays).

The remainder of this section describes the procedures used to develop and validate the particular elements of the economic impact model.

2. Inputs from Gravity Model

The trip distribution matrices that are output from the gravity model are critical inputs to the Economic Effects Model. Economic effects for a geopiece are determined by the number of coastal recreation participants in that geopiece, and by the origins of those participants. Each of the values in the 63 x 1 vector of trips distributed to a geopiece is significant to a varying degree. Participants emanating from the same county as the particular geopiece are considered local, and it is assumed that they would likely spend similar amounts of money in the area whether or not they participate in coastal recreation. Participants emanating from adjacent counties are considered to be potential spenders, and are included in the day-use category of tourist spending. The remaining participants are considered likely to spend the night, and are consequently classified as overnight visitors.

Both the baseline and the impact trip distribution matrices are input to the economic effects model. The entries are summed to local, non-local day use, and non-local overnight categories before spending changes from baseline to impact condition are calculated.

Because the gravity model redistributes trips among geopieces, the tendency for recreationists to be diverted to neighboring coastal areas is accounted for in the model. For example, closure of a beach in one area can increase beach attendance in other areas, and the gravity model explicitly considers this possibility. As a result, reductions at a county level of geographic detail usually are not as great as reductions for one geopiece within the county, because some of the attendance and thus tourist spending would be diverted to other portions of the county.

3. Compilation of Visitor Spending Profiles

This section describes the data sources, methods, and assumptions used to prepare visitor spending profiles for each of the coastal recreation types in this analysis. To provide a picture of the types of information needed to conduct the analysis, we focus first on the structure of the model used to estimate the economic impacts of tourism and recreation changes.

The second step is to inventory the available data on coastal California tourism and assess the accuracy, proper application, and limitations of this information. Since no new survey work was conducted as part of this study, substantial effort is required here to specify key definitions (such as "tourist" or "visitor") and assumptions made explicitly or implicitly in previous studies.

Third, data from prior surveys are synthesized and compared to derive a plausible range of tourism expenditure estimates suitable for this analysis. These estimates can be considered the best available at the present time, though additional surveys could no doubt supply more current information. Use of previously compiled information in this fashion will, however, provide sufficient accuracy for use in assessing the economic impacts of offshore oil and gas development on the tourism sector.

<u>Structure of Visitor Spending.</u> The recreation demand model developed for this study focuses on four types of ocean-related activities, as potentially impacted by offshore oil and gas development: (1) boating, (2) fishing, (3) water-dependent coastal recreation, and (4) water-enhanced recreation. Participants in these recreational activities are further classified as overnight visitors, day visitors, and local residents. Local residents are excluded from the economic impact analysis, since any changes in their ocean-related recreation expenditures would very likely be offset by compensating expenditures for other goods and services in the same area.

Participation in ocean-related recreation is projected for visitors originating in each of California's 58 counties (with Los Angeles County further subdivided to avoid biases in forecasting trip distributions). Additional participation also is projected for visitors from outside California (with no distinction between domestic U.S. and foreign visitors).

The expenditure and economic impact analysis, like the recreation demand analysis, concentrates on ocean-related recreation. Other kinds of tourism and recreation activity -- such as general sightseeing in non-beach areas of the coastal counties, spectator sports, and visits to amusement parks or zoos -- are not included as part of the formal model. These non-ocean-related activities create sales, jobs, and income in the coastal areas. However, they are not included in the model simply because their relationship to offshore oil and gas development is judged to be very slight, if it exists at all.

Given the specification of recreation activity and participation, the information needed to quantify the direct economic effects of ocean-related tourism consists of two vectors of data for each activity:

- Expenditure in 1982 dollars (consistent with the other monetary figures used in the model) by **overnight visitors** by type of good or service purchased and by activity; and

- Expenditures in 1982 dollars by **day-trip visitors** by type of good or service purchased and by activity.

Ideally, these estimates of direct visitor expenditures would vary with the place of origin and place of destination, as well as with length of stay, type of good or service, and activity. The origin of visitors may be indicative of such socioeconomic characteristics as income and education, and these factors could very likely influence both the magnitude and composition of recreation expenditures. By the same token, different destinations offer differing services or purchase opportunities, and these supply factors help determine what visitors buy.

In practice, however, the availability of uniform, reliable, and consistent data with which to evaluate these particular supply and demand influences on visitor spending is very limited. Coastal destination areas generally assess their own tourism expenditure patterns and related factors for local market development purposes. Expenditure estimates prepared by each coastal area (visitors bureau, municipality, or planning organization) tend, however, to be designed specifically for that jurisdiction. Definitions, measurement methods, and assessment techniques vary sharply from one location to another. Attempts to compare estimates between areas are frustrated by these differing definitions and techniques. Observed variations in results may be due more to differences in survey design and coverage than to differences in visitor behavior.

Data on spending by origin of visitor are even poorer than data on spending by destination. The fragments of evidence which are available relate to specific destinations as well as to regions of origin. For example, data on San Diego tourism spending patterns may be specific to the region of origin of the visitor (such as Northern California) as well as to the destination. But these data are simply too spotty to be very useful in a statewide application.

Available Tourism Expenditure Data. A number of prior surveys have been conducted related to coastal California tourism. Most of these have been conducted by local Visitors Bureaus in coastal cities, though others have been prepared for specific activities regardless of the locality of the destination. The prior surveys reviewed for this study include the following:

- City of San Diego, 1973 survey published in 1974 by A.D. Little, Inc., and Copley International Corporation (see San Diego, 1974);

- City of San Diego, annual tourism activity reports prepared for the San Diego Convention and Visitors Bureau (SDCVB) by C.I.C. Research, Inc. (formerly Copley International Corporation; see SDCVB, 1983a and 1983b);

- Monterey Peninsula and Santa Cruz County, 1978 survey prepared for the Association of Monterey Bay Area Governments (AMBAG) by Recht Hausrath and Associates (see AMBAG, n.d.);

- Southern California marine recreational fishing, 1983 survey for the National Coalition for Marine Conservation (NCMC) by Jones and Stokes Associates (see NCMC, 1985);

- Pacific Coast (California, Oregon, and Washington) marine recreational fishing, 1981 survey by the National Marine Fisheries Service (NMFS), prepared by Energy and Resource Consultants, Inc. (see NMFS, 1985);

- Santa Barbara, 1984 visitor survey for the Santa barbara Conference and Visitors Bureau (SBCVB) by Haug International, and annual SBCVB reports on visitor activity (see SBCVB, annual reports, and SBCVB, 1984);

- Santa Monica, 1984 estimates of visitor spending, prepared by the santa Monica Convention and Visitors Bureau (SMCVB; see SMCVB, 1984);

- San Francisco, 1978-84 estimates of visitor spending, prepared by the San Francisco Convention and Visitors Bureau (SFCVB; see SFCVB, 1985); and

- Greater Los Angeles, 1984 estimate of visitor spending, prepared by the Greater Los Angeles Visitors and Convention Bureau (GLAVCB; see GLAVCB, 1985).

These studies were performed at different times during the last 12 years, for different areas of the California coast (and in the case of the NMFS survey, Oregon and Washington, as well), and using different methods. Two of the studies — NCMC, 1985 and NMFS, 1985 — were targeted on marine recreational fishing for the purpose of estimating market and non-market values of fishery resources. Two others — City of San Diego, 1974, and AMBAG, undated -- were more comprehensive, systematically designed surveys of a broad spectrum of visitors. Tourism activity estimates for San Francisco, Los Angeles, Santa Monica, and Santa Barbara combine partial survey data with transient occupancy tax records, hotel occupancy rates, and other data sources to prepare tourism estimates.

The studies used differing definitions of "tourism" and "visitor." All of the surveys were designed to include persons visiting a particular destination while residing some distance away. Some of the studies -- especially City of San Diego, 1974, and NCMC, 1985 — explicitly included both visitors to an area and local or nearby residents. These two studies systematically reported participation days (or tourist-days) by category or origin — for City of San Diego, San Diego County, Southern California, Northern California, and out-of-state; and for NCMC: coastal, non-coastal California, and out-of-state. The various convention and visitor bureaus frequently can provide data on the mix of visitors by origin, but do not typically publish spending profiles for each origin category.

Most of the studies designed to measure broad-scale tourism activity rely on a combination of personal interviews, telephone interviews, and mail-back questionnaires distributed at hotels and principal visitor attractions. Some activities -- such as beachgoing or boating -- may be systematically under-represented using this approach unless attempts were made to interview participants in these activities. Similarly, such distribution techniques are likely to overrepresent lodging or food expenses, and possibly overestimate all categories of expenses.

Table 3-19 summarizes the principal findings of the various studies reviewed for this analysis. Particular attention is focused on the reported values of spending per visitor-day. All dollar estimates have been converted to 1982 dollars to facilitate comparison.

The City of San Diego survey encompasses the broadest range of activities among the studies reviewed. Eight different tourist and outdoor or marine recreation activities were specifically identified in the study. Three of these — saltwater bathing, boating, and fishing -- correspond very closely to the ocean-related recreation activities on which the present study is focused.

Unfortunately, the survey is more than a decade old, with the interviews performed during the summer of 1973 to winter 1973-74 period. Moreover, the multi-purpose nature of coastal visits analyzed in the study may pose problems in relating survey responses to the particular activities. Each respondent was asked to specify his primary activity or purpose for visiting San Diego. It is very likely, however, that a large share of respondents engaged in more than one activity while in the city — for example, combining sightseeing and salt-water bathing with a business trip. It then becomes difficult to disaggregate the expenditures associated with a particular activity because some outlays — such as for hotels and meals -- cannot be immediately attributed to any particular activity.

The San Diego survey is noteworthy for its explicit treatment of tourism activities by origin of participant — including local (city and county) residents. This permits analysis of substitution possibilities for local residents, particularly the effects of local people choosing to engage in recreation activities close to home rather than going elsewhere for these activities.

Spending per tourist day in San Diego ranged from $2.01 to $70.36 depending on the local-nonresident mix, activities involved, and type of accommodation.

The AMBAG study, like that of the City of San Diego, was directed toward a broad spectrum of tourist or visitor activities. The geographic region covered by the study is the Monterey Peninsula and Santa Cruz County. The survey was conducted in April 1978 — five years more recent than the San Diego survey but still quite old for the purpose of current analysis.

AMBAG distinguished the spending behavior of overnight visitors from those of day visitors, and further reported overnight visitor spending by category of room rate paid ($30-45 per night, for example). The survey was conducted at wharf

Table 3-19: Estimates of total spending per visitor-day, selected California coastal locations and activities (page 1 of 2).

Study	Location, Yr	Activity	Total Spending per Visitor Day (1982$)
City of San Diego, 1974	San Diego, 1973	Business	$25.10 - $60.63*
		Convention	22.78 - 70.36*
		Saltwater bathing	2.01 - 17.17*
		Saltwater boating	3.47 - 38.30*
		Saltwater fishing	7.44 - 28.80*
		Other outdoor	4.00 - 21.81*
		Spectator sports	2.55 - 22.94*
		Sightseeing	3.91 - 28.22*
SDCVB, 1983a	San Diego, 1982	Tourism, business, convention	$37.00, ranging from $8.00 to $55.00 depending on day/overnight status and accommodation type
SDCVB, 1983b	San Diego, 1982	Tourism, business, convention	$30.72
AMBAG, undated	Monterey Peninsula, 1978	Tourism	$13.80 - $14.40, day visits
		Business	$9.97 - $102.01, overnight, depending on accommodations
	Santa Cruz County, 1978		$8.34 - $10.64, day visits
			$9.97 - $69.30, overnight, depending on accommodations
NCMC	Southern California, 1983	Marine fishing	
		-manmade structures	$20.53 per trip
		-beach/bank	32.38 per trip
		-party/charter boat	69.73 per trip (1 day or less)
		-private/rental boat	75.96 per trip (12 hrs or less)

*varies by origin

Table 3-19 Estimates of total spending per visitor-day, selected California coastal locations and activities (page 2 of 2).

Study	Location, Yr	Activity	Total Spending per Visitor Day (1982$)
NMFS, 1985	Pacific Coast, 1981	Marine fishing	
		-manmade structures	$18.03 per trip
		-beach/bank	38.64 per trip
		-party/charter boat	69.73 per trip (1 day or less)
		-private/rental boat	31.30 per trip
SBCVB, 1982	Santa Barbara, 1982	Tourism, business	$12.00 - $82.30, varies with day/ overnight accommodations
SMCVB, 1984	Santa Monica, 1983	Tourism, business	$30.42
GLAVCB, 1985	Greater Los Angeles, 1984	Tourism, business	$35.35

areas, beaches, shopping areas, parks, and other visitor attraction in the Peninsula-Santa Cruz County area. The study identified the general purpose of visits to the area -- vacation/recreation, visits to friends/family, sightseeing, convention, business, and other -- but did not disaggregate the specific ocean-related activities in which visitors may be engaged.

Unlike the San Diego survey, however, no explicit attempt was made to identify the spending behavior of local residents in relation to recreation activities. The interviewers terminated the interview as soon as the place of residence was identified as local.

The study concluded that average day visitor expenditures per person ranged from \$13.80 to \$14.40 on the Monterey Peninsula and from \$8.34 to \$10.64 in Santa Cruz County (all in 1982 dollars). Overnight visitor spending in these areas varied sharply with the type of accommodation chosen. Visitors staying in campgrounds spent an average of \$9.97 per person per day. Visitors staying in the higher-priced hotels, on the other hand, spent an average of \$69.30 per day per person in Santa Cruz County, and \$102.01 per day per person in the Monterey Peninsula.

The authors of the AMBAG study, however, qualified these conclusions in a significant way. "Our judgment is that the survey sample, while a good representation of those who would patronize a new facility oriented to recreation visitors, tends to overstate spending when applied to all hotel/motel, camping, and day visitors to the AMBAG coastal areas." (AMBAG, undated, p.20). In the present analysis, therefore, the AMBAG results are treated as upper limits on visitor-day spending, with more likely values being lower than found by AMBAG.

The NCMC study of marine recreational fishing differs from both the San Diego and AMBAG studies in its focus on a single activity. The geographic coverage of the NCMC survey is Southern California; the survey year is 1983. Spending per angler trip (generally one day, except for multi-day boating excursions) is reported for four different fishing modes — man-made structures (such as a wharf or jetty), beach/bank, party/charter boat, and private/rental boat.

As reported in Table 3-19, the NCMC results (in 1982 dollars) showed marine recreational expenditures to be as follows:

- Man-made structures: \$20.53 per angler trip
- Beach/bank: \$32.38 per angler trip
- Party/charter boat: \$69.73 per angler trip
- Private/rental boat: \$75.96 per angler trip

The boat fishing results identified here are for single-day trips only.

The NCMC survey is the most recent of all surveys reviewed in this study. It covers explicitly one of the ocean activities — marine recreational fishing -- of central concern in this study. Moreover, by distinguishing between different fishing modes, it indirectly provides data useful in evaluating the spending characteristics of participants in marine boating generally — rather than just boat fishing — as well as participants in beach activities.

The study does not report spending profiles by place of origin or length of stay (day trip as opposed to overnight). It does, however, draw on the results of the 1983 National Marine Fisheries Survey to identify participation days by fishing mode. The NCMC study also presents a disaggregation of visitor spending by purchase, and this permits a breakout of the lodging-related expenses that are the principal distinction between day trips and overnight trips.

Because of the activity-related focus and current data base of the NCMC study, it is used as the principal source of visitor spending patterns in this analysis. Other surveys are used for comparative purposes, or to supplement known data gaps in the NCMC study.

The convention and visitors bureau surveys cited in Table 3-19 yield results of the same general magnitude as the San Diego and AMBAG studies. Visitor spending per person per day in Santa Barbara ranged from $12.00 to $82.30 in 1982, depending on duration of stay. San Diego visitors (using different data sources) spent $8.00 to $55.00 per day per person, averaging $37.00 by one accounting and $30.72 by another. Santa Monica visitors spent a comparable $30.42 per person per day, and greater Los Angeles area visitors spent $35.35 per person per day.

In addition, the NMFS (1985) study provides a basis of comparison for the NCMC results. The NMFS study does not, however, provide a breakdown of spending by type of good or service purchased, and covers the entire Pacific Coast from Mexico to Canada. The NMFS results for total spending are quite close to the NCMC findings for man-made structures ($18.03 for NMFS, $20.53 for NCMC). The NMFS results are higher for beach/bank fishing ($38.64 for NMFS, $32.38 for NCMC). Major differences occur for the boating categories ($69.73 - $75.96 for NCMC, and only $31.30 - $44.58 for NMFS). Without a breakdown of purchases by type for the NMFS data, however, it is not possible to assess the reasons for these differences.

Deriving Visitor Spending Profiles. Tables 3-20 through 3-24 present the derivation of visitor spending patterns used in this study. The recent NCMC study is used as the basis for estimating spending profiles for all of the activities of interest.

Table 3-20 presents the expenditure findings of the NCMC survey for each fishing mode, and all modes together, by spending category. Table 3-21 presents the participation day information (from the Draft Recreational Fishery Statistics Survey, Pacific Coast, 1983) used by NCMC in computing total expenditures.

Table 3-22 documents the calculations used to derive a profile of visitor-day expenditures for all fishing modes combined. Total expenditures by category are divided by total angling trips (virtually all of which are single-day trips) to derive spending per visitor-day in 1983 dollars. These values are converted to 1982 dollars using the personal consumption expenditures implicit price deflator, and adjustments are made to specific categories as required to derive values most appropriate for this study.

License fees are excluded from the analysis, since these represent state revenues and have no local economic or fiscal impact. Lodging expenses are adjusted to assess overnight visitor spending compared to day visitor spending. Noncoastal and out-of-state participants are used as the basis for making these lodging cost estimates.

Table 3-23 provides similar data for marine boating. In this case, boat-fishing spending is used as a starting point for the analysis, with exclusions for items related specifically to fishing. All boat-related expenditures are trip marginal costs only, and do not include durable equipment and vessel costs themselves.

Table 3-20 Estimated total trip expenditures by marine recreational anglers in Southern California in 1983 (thousands of 1983 dollars), by fishing mode and expenditure category.

Expenditure Category	Man-Made Structures	Beach/ Bank	Party Charter Boat	Private/ Rental Boat	All Modes
Boat fees	-	-	$ 58,042.5	$ 5,101.3	$ 63,143.8
Fishing licenses	$ 2,195.1	$ 1,747.4	3,522.1	6,422.9	13,887.5
Fish cleaning	129.1	54.6	1,835.7	366.1	2,385.5
Terminal tackle	3,042.5	4,446.6	2,716.2	16,186.8	26,392.1
Bait	2,703.6	1,552.4	1,044.7	9,018.6	14,319.3
Equipment rental	-	-	5,805.5	1,414.1	7,219.6
Gasoline	7,953.0	8,231.4	13,334.0	21,138.5	50,656.9
Boat fuel	-	-	-	65,474.0	65,474.0
Food and beverages	6,296.2	8,506.4	8,596.3	27,117.5	50,516.4
Lodging	1,448.2	1,384.8	5,135.8	2,551.5	10,520.3
Public transportation	162.3	168.0	257.4	431.4	1,019.1
Total expenditures	$23,930.0	$26,091.6	$100,290.2	$155,222.7	$305,534.5

Source: NCMC, 1985, p. 31 (Table 14).

Table 3-21 Participation days in marine recreational fising in Southern California, 1983 (thousands of participant days), by origin of participant and fishing mode.

Origin	**Man-Made Structures**	**Beach/ Bank**	**Party Charter Boat**	**Private/ Rental Boat**	**Total, All Modes**
California					
Coastal county	1,032	680	1,045	1,777	4,534
Noncoastal county	13	10	9	39	71
Out of State	79	86	176	92	433
Total	1,124	776	1,230	1,908	5,038

Note: Totals shown here have been recomputed from the original source table to eliminate minor rounding errors. Participation days correspond to angler effort (trips) except for small number of multi-day trips, mostly to Mexico on charter vessels.

Source: NCMC, 1985, p.8 (Table 1). Adapted from National Marine Fisheries Service, Draft Recreational Fishery Statistics Survey, Pacific Coast, 1983.

Table 3-22 Derivation of visitor-day expenditure profile: marine recreational fishing (all modes).

Expenditure Category	1983 Dollars Expenditure	1983 Dollars $/Visitor Day[a]	1982 $/Visitor Day Day Trip	1982 $/Visitor Day Overnight	Input-output Sector
Boat fees	$ 63,143.8	$12.53	$12.08	$12.08	Services
Fishing licenses	13,887.5	2.76	-[b]	-[b]	-[b]
Fish cleaning	2,355.5	0.47	0.45	0.45	Services
Terminal tackle	26,392.1	5.24	5.05	5.05	Retail trade
Bait	14,318.7	2.84	2.74	2.74	Retail trade
Equipment rental	7,219.6	1.43	1.38	1.38	Services
Gasoline	50,656.9	8.04[c]	7.75	7.75	Auto repair/ service
Boat fuel	65,474.0	8.66[d]	8.35	8.35	Auto repair/ service
Food/beverages	50,516.4	10.03	9.67	9.67	Eating/drinking places
Lodging	10,520.3	2.09	-	20.13[e]	Hotels/lodging places
Public transport	1,019.1	0.20	0.19	0.19	Transportation
Total	$305,503.9	54.29	47.66	67.79	-

Notes:

a. Calculated by dividing total expenditures by total participant days (5,038,000 per year). This includes coastal county residents, but offsets potential bias from non-local purchases by visitors, which are included in trip total expenditure.

b. Excluded from profile since it is state revenue, without local economic or fiscal impact.

c. Reduced by 20 percent to account for expenditures outside the coastal county. NMFS survey indicated 80 percent of incidental transportation outlays were within 5 miles of the coast. This proportion is assumed to apply to coastal county gasoline purchases (NOAA/NMFS, 1983).

d. Reduced by one-third to account for unusually high number of (long distance) billfish trips during the survey year, 1983, the year of "El Nino."

e. Calculated as total expenditure ($10,520.3) divided by non-coastal and out-of-state visits (433+71 = 504), coverted to 1982 dollars by multiplying by 0.9644; i.e., ($10,520.3) (0.9644)/504 = $20.13.

Source: NCMC, 1985, p. 31 (Table 14). For price deflator (206.0/213.6 = 0.9644), Council of Economic Advisors, 1985, p. 236.

Table 3-23 Derivation of visitor-day expenditure profile: marine boating.

Expenditure Category	1983 Dollars Expenditure	1983 Dollars $/Visitor Day[a]	1982 $/Visitor Day Day Trip	1982 $/Visitor Day Overnight	Input-output Sector
Boat fees	$ 5,101.3	$ 2.67	$ 2.57	$ 2.57	Services
Equipment rental	1,414.1	0.74	0.71	0.71	Services
Gasoline	21,138.5	8.86[b]	8.55	8.55	Auto repair/ service
Boat fuel	n.a.	8.66[c]	8.35	8.35	Auto repair/ service
Food/beverage	27,117.5	14.21	13.70	13.70	Eating/drinking places
Lodging	2,551.5	1.34	-	18.78[d]	Hotels/lodging places
Public transport	431.4	0.23	0.22	0.22	Transportation
Other goods	-	-	0.99[e]	0.99[e]	Retail trade
Total[f]	n.a.	36.71	35.09	53.87	-

Notes: a. Calculated by dividing private/rental boat expenditures by total participant days (1,908,000 per year).

b. Reduced by 20 percent to account for expenditures outside the coastal county. NMFS survey indicated 80 percent of incidental transportation outlays were within 5 miles of the coast. This proportion is assumed to apply to coastal county gasoline purchases (NOAA/NMFS, 1983).

c. Boat fuel consumption is assumed to be equal to expenditures for marine fishing.

d. Derived as total lodging expenditure ($2,551,500) divided by non-coastal plus out-of-state visits (39,000 + 92,000 = 131,000), converted to 1982 dollars by multiplying by 0.9644; i.e., ($2,551.5) (0.9644)/131 = $18.78.

e. Derived from City of San Diego survey findings for retail trade spending per visitor for salt-water boating. Replaces NCMC retail trade result, since NCMC counted fishing-related retail trade spending only.

f. Total shown includes only those boating-related elements of the spending profile. Fishing-related outlays for tackle, bait, and other items consequently are excluded.

Sources: NCMC (1985), p. 31 (Table 14) and p. 8 (Table 1), results for private/rental boating trips only. For other goods, City of San Diego, 1974, p. 73 (Table 27) and p. 79 (Table 30). For price deflator (206.0/213.6, or 0.9644), Council of Economic Advisors, 1985, p. 236.

Table 3-24 Derivation of visitor-day expenditure profile: water-dependent and water-enhanced beach activities.

Expenditure Category	1983 Dollars		1982 $/Visitor Day		Input-output Sector
	Expenditure[a]	$/Visitor Day[b]	Day Trip	Overnight	
Gasoline	$16,184.4	$ 8.52	$ 3.57[c]	$ 3.57[c]	Auto repair/ service
Food/beverage	14,802.6	7.79	3.27[d]	3.27[d]	Eating/drinking places
Lodging	2,833.0	1.49	-	14.53[e]	Hotels/lodging places
Public transport	330.3	0.17	0.16	0.16	Transportation
Other services	-	-	1.46[f]	1.46[f]	Services
Other goods	-	-	4.68[f]	4.68[f]	Retail trade
Total[g]	$34,780.3	17.97	13.14	27.67	

Notes: a. Sum of expenditures for categories shown for man-made structures ar beach/bank fishing.

b. Calculated as expenditure in each category divided by total participatic days for man-made structures and beach/bank fishing (1,124,000 + 776,000 1,900,000 participant days).

c. Figure shown is $8.52 converted to 1982 dollars (multiplied by 0.9644) divided by 2.3 to account for larger party sizes in beach activitie generally than in fishing particularly (see AMBAG, undated, p. 7); i.e. ($8.52) (0.9644)/2.3 = $3.57.

d. Figure shown is $7.79 converted to 1982 dollars (multiplied by 0.9644) divided by 2.3 to account for larger party sizes in beach activitie generally than in fishing particularly (see AMBAG, undated, p. 7); i.e. ($7.79) (0.9644)/2.3 = $3.27.

e. Calculated from total lodging expenditure shown ($2,833.0) converted t 1982 dollars (by multiplying by 0.9644), and dividing ty total participant from non-coastal California counties and out-of-state (13 + 79 thousand fo man-made structures plus 10 + 86 for beach/bank fishing, or 188 in all).

f. Taken from San Diego, 1974, findings for retail trade and service spendir patterns for salt-water bathing participants, non-residents only. Thes replace the NCMC results for retail trade and service outlays by fishermer which cover fishing-related purchases only.

Notes: (cont'd)

g. Total is for expenditure categories shown, and does not include purely fishing-related spending in NCMC results.

Sources: NCMC (1985) p. 31 (Table 14) and p. 8 (Table 1), results for man-made structures and beach/bank fishing only. For other goods and services, City of San Diego (1974), p. 73 (Table 27) and p. 79 (Table 30). For party sizes, AMBAG (undated), p. 7. For price deflator (206.0/213.6, or 0.9644), Council of Economic Advisors (1985), p. 236 (personal consumption expenditures deflator).

This is consistent with the purpose of this study, since oil spills or degraded enjoyment as potential impacts are more likely to cause reductions in the number of trips taken or shifts in their locations, rather than complete abandonment of vessels.

Lodging costs for boating trips are adjusted in a fashion similar to fishing. In addition, boating-related retail goods purchases are added (from the City of San Diego survey) to offset the removal of fishing-related purchases from the profile.

Table 3-24 presents the results of the analysis for both water-dependent and water-enhanced beach activities. These estimates are based on the shore fishing data compiled in the NCMC survey, again with exclusion of fishing-related purchases and inclusion of other purchases as estimated in the City of San Diego survey.

The resulting estimates for the individual activities can be summarized as follows (1982 dollars per visitor day):

Activity	Day Trip	Overnight Trip
Marine fishing	$47.66	$67.79
Marine boating	35.09	53.87
Water-related	13.14	27.67
Water-enhanced	13.14	27.67

4. Input-Output Multipliers.

Visitor spending patterns and the number of projected participation days in a coastal region are the main determinants of direct impacts on the tourism economy. The indirect and induced consequences of these direct spending impacts are best measured using input-output (I-O) multipliers for the coastal economies.

Multipliers and their Meaning. Regional input-output models are designed to trace the effects of expenditures in particular sectors (such as hotels or retail trade) as they "ripple" through the local economy. Increased visitation in the hotel sector, for example, leads to greater demands for linen supply, food service, and hotel personnel. This rise in demand in turn increases the incomes of firms and workers who supply the needed services, and they buy more from local establishments as well. The overall effect of an initial change in demand (such as the initial visitor purchase) is represented by a "multiplier" derived from the regional input-output model.

The multipliers used in this analysis capture the relationship between the initial spending effect (in more technical terms, the change in final demand) and the overall effect on regional production (also known as total gross output). For example, a multiplier of 2.4 means that an initial change in demand of $1.00 leads to a total increase in output or sales of $2.40, including the $1.00 which triggered the economic change in the first place.

Other kinds of multipliers are frequently used in input-output studies to capture various kinds of effects. Examples of such multipliers include employment multipliers, income multipliers, output multipliers, and several variations on each of these. Regardless of how the relationships are expressed, the interindustry structure of the economy is the major determinant of the size of the multiplier in each case. Equivalent answers can be derived from an input-output analysis regardless of which relationship is chosen to perform the actual calculations.

The most important factor influencing the interpretation of input-output multipliers in a particular study is whether the model includes household spending as a component of the multiplier. Earnings received by households in the region are the basis for regional consumer spending. If these earning-spending relationships are excluded from the analysis, the only source of multiplier effects from an initial demand change is the impact of increased spending by businesses. In conventional input-output terminology, these business-respending effects are called "indirect" impacts of the initial demand change. The household-respending effects are termed "induced" impacts of the initial change in demand.

This analysis includes household respending as well as business respending in the model, and therefore reflects both the indirect and induced effects of demand changes. Indirect and induced impacts, combined with the initial (direct) spending projection, yields the total effect on the regional economy from the change in demand. The multipliers estimated for this study capture these total effects for each of the counties and each of the sectors under analysis.

Deriving the I-O Multipliers. The regional I-O models used in this study were derived using an independently maintained version of the Regional Interindustry Modeling System (RIMS) originally developed by the U.S. Bureau of Economic Analysis (BEA). RIMS is an automated set of data bases and analytical software designed to estimate regional I-O coefficients for any specified county or group of counties in the United States.

RIMS starts with detailed economic relationships developed by BEA for detailed U.S. industries. The entire U.S. economy is broken down into approximately 530 sectors, with the linkages (sales and purchases) among these sectors explicitly identified. The latest year for which these data currently are available is 1977.

County Business Patterns (CBP), published by the U.S. Bureau of the Census, is the principal source of information on detailed employment and earnings patterns at the county level throughout the nation. Some of these data are withheld from publication in order to avoid disclosing potentially confidential business information, and a processing routine is used in the analysis to fill these deliberately created data gaps. These comprehensive files are then reorganized to correspond to the 530 sectors in the U.S. I-O study. The most recent CBP data available for this study are for 1982.

The national industry relationships are then "regionalized" to the county or multi-county level using the CBP data. This approach assumes the major difference between the regional and national economies is the extent of trade with other areas. Regional economies are much more "open" than the nation as a whole, and consequently have lower multipliers due to the greater "leakage" of expenditures to other areas.

These inter-regional trade effects are captured by scaling down, as appropriate, each sector's national requirements coefficients. This is accomplished using as an indicator of the extent of trade the relative degree of specialization in a particular sector in the region compared to the nation as a whole. For example, if the region's motor freight and warehousing sector represents 1 percent of total regional payrolls, while for the nation as a whole it represents 2 percent of payrolls, the "location quotient" or measure of relative specialization is 0.01/0.02, or 0.50. Coefficients related to the region's ability to supply these transport services are consequently scaled down by a factor of 0.50. This reflects the increased likelihood of imports (use of firms outside the region) to provide needed services.

The regional I-O matrix of technical coefficients is created using a similar approach for each of the 530 sectors in the original data base. If a sector is absent from a region, it is simply dropped from the matrix. The resulting detailed I-O matrix for the region is then aggregated to a more manageable number of sectors. Sectors where direct spending effects are likely (such as hotels and lodging places) are left as distinct industries. Others in which no direct impacts are expected (such as manufacturing) are aggregated from a large number of sectors to just a few.

The matrix of technical coefficients for the study area economy is then used to calculate a second table of total (direct, indirect, and induced) requirements coefficients. These are derived by estimating the so-called "Leontief inverse" from the original regional coefficient table. This table is further collapsed to show the effects of a spending change in a detailed sector (such as automobile repair and services) on each broader industry grouping (services, retail trade, construction, and so forth).

Estimated Multipliers. Tables 3-25 through 3-39 display the input-output multipliers resulting from this analysis. The easiest way to interpret these values is to look at a specific case. For example, in San Diego County, a $1.00 increase in demand for hotels and lodging services results in increased output in each sector of the economy. Some sectors are more affected than others, due to the specific characteristics of the hotel and lodging industry. In this case, the total (direct, indirect, and induced) effects on regional output from the $1.00 initial change in demand consists of the following sector-by-sector changes:

Sector	Output Effect (Multiplier Component)
Agriculture, forestry, and fisheries	$0.0163
Mining	0.0007
Construction	0.0547
Manufacturing	0.1029
Transportation, communication, utilities	0.1211
Trade	0.1274
Finance, insurance, real estate	0.2251
Services (including hotels/lodging places)	1.2710
Government enterprises and other	0.0103
Households (earnings)	0.6100
Total	2.5395

That is, a $1.00 initial change in demand results in a total sales impact of $1.2710 from the services sector (including the initial $1.00 in sales by hotels and lodging places); $0.2251 from finance, insurance, and real estate; $0.1274 from the trade sector; and so forth. The household impact of $0.6100 indicates the total effect on regional household earnings from the initial change. The total output (sales) effect of the $1.00 final demand change consequently is estimated at about $2.54.

The multipliers, in conjunction with direct spending estimates derived in the model, are then used to produce projections of total sales impacts of visitor spending. Additional coefficients and parameters in the model then relate these changes in output to changes in employment, income, and tax revenues for the local areas.

Table 3-25

Total Direct, Indirect and Induced Multipliers for Coastal Recreation-Related Expenditures

County: Del Norte

	Retail Trade	Hotels & Lodging Places	Eating & Drinking Places	Auto Repair & Services	Trans-portation	Other Services
Agric., Forestry & Fisheries	.0045	.0066	.0222	.0128	.0050	.0055
Mining	.0000	.0000	.0000	.0000	.0000	.0000
Construction	.0109	.0227	.0082	.0076	.0110	.0133
Manufacturing	.0088	.0135	.0409	.0568	.0107	.0109
Communication & Utilities	.0867	.1124	.0650	.0597	1.1769	.0702
Trade	1.0964	.0837	.0935	.1442	.1156	.0919
Finance, Insurance & Real Estate	.1720	.1480	.1123	.0922	.1339	.1478
Services	.0986	1.0913	1.0665	1.0622	.1214	1.1047
Government Enterprises & Other	.0129	.0150	.0069	.0049	.0080	.0113
Households	.5541	.4641	.3932	.3841	.5792	.5068
Total Gross Output Multiplier	2.0449	1.9573	1.8087	1.8245	2.1617	1.9624

Source: Estimated by Applied Economic Systems, Inc., June 1985.

Table 3-26

Total Direct, Indirect and Induced Multipliers for Coastal Recreation-Related Expenditures

County: Humboldt

	Retail Trade	Hotels & Lodging Places	Eating & Drinking Places	Auto Repair & Services	Trans-portation	Other Services
Agric., Forestry & Fisheries	.0108	.0143	.0326	.0072	.0093	.0113
Mining	.0000	.0000	.0000	.0000	.0000	.0000
Construction	.0111	.0256	.0098	.0085	.0208	.0148
Manufacturing	.0533	.0501	.1232	.0338	.0387	.0489
Communication & Utilities	.0532	.0537	.0480	.0528	1.1612	.0475
Trade	1.1172	.1027	.1264	.1758	.1383	.1229
Finance, Insurance & Real Estate	.1415	.1319	.1048	.0834	.1226	.1352
Services	.1746	1.1686	1.1324	1.1115	.1801	1.2000
Government Enterprises & Other	.0096	.0087	.0049	.0036	.0059	.0097
Households	.6106	.5134	.4591	.4211	.6349	.6187
Total Gross Output Multiplier	2.1819	2.0690	2.0412	1.8977	2.3118	2.2090

Source: Estimated by Applied Economic Systems, Inc., June 1985.

Table 3-27

Total Direct, Indirect and Induced Multipliers for Coastal Recreation-Related Expenditures

County: Mendocino

	Retail Trade	Hotels & Lodging Places	Eating & Drinking Places	Auto Repair & Services	Trans-portation	Other Services
Agri., Forestry & Fisheries	.0095	.0112	.0264	.0058	.0081	.0102
Mining	.0002	.0003	.0002	.0001	.0002	.0002
Construction	.0120	.0281	.0098	.0088	.0121	.0164
Manufacturing	.0408	[illegible]	[illegible]	.0225	.0281	.0382
Communication & Utilities	.1048	.1438	.0834	.0731	1.2137	.0962
Trade	1.1078	.0958	.1105	.1600	.1304	.1144
Finance, Insurance & Real Estate	.1398	.1261	.0972	.0791	.1193	.1334
Services	.1385	1.1377	1.1001	1.0894	.1505	1.1638
Government Enterprises & Other	.0089	.0081	.0041	.0031	.0050	.0089
Households	.5833	.4967	.4231	.3938	.6162	.6010
Total Gross Output Multiplier	2.1456	2.0589	1.9280	1.8357	2.2836	2.1827

Source: Estimated by Applied Economic Systems, Inc., June 1985.

Table 3-28

Total Direct, Indirect and Induced Multipliers for Coastal Recreation-Related Expenditures

County: Sonoma

	Retail Trade	Hotels & Lodging Places	Eating & Drinking Places	Auto Repair & Services	Trans-portation	Other Services
Agric., Forestry & Fisheries	.0154	.0204	.0396	.0134	.0148	.0168
Mining	.0021	.0030	.0018	.0015	.0021	.0020
Construction	.0277	.0545	.0233	.0201	.0490	.0330
Manufacturing	.0817	.0945	.1577	.0889	.0728	.0844
Communication & Utilities	.1216	.1652	.1017	.0912	1.1704	.1116
Trade	1.1443	.1354	.1574	.2052	.1667	.1476
Finance, Insurance & Real Estate	.2615	.2506	.1927	.1510	.2150	.2426
Services	.2112	1.2238	1.1785	1.1399	.2098	1.2414
Government Enterprises & Other	.0105	.0099	.0059	.0044	.0067	.0110
Households	.7160	.6388	.5590	.5050	.7356	.7079
Total Gross Output Multiplier	2.5920	2.5961	2.4176	2.2206	2.6429	2.5983

Source: Estimated by Applied Economic Systems, Inc., June 1985.

Table 3-29

Total Direct, Indirect and Induced Multipliers for Coastal Recreation-Related Expenditures

County: Marin

	Retail Trade	Hotels & Lodging Places	Eating & Drinking Places	Auto Repair & Services	Trans-portation	Other Services
Agric., Forestry & Fisheries	.0066	.0105	.0229	.0044	.0059	.0075
Mining	[illegible]	.0009	.0005	.0004	.0006	.0006
Construction	.0267	.0534	.0209	.0183	.0249	.0315
Manufacturing	.0495	.0565	.0531	.0416	.0370	.0520
Communication & Utilities	.0929	.1315	.0696	.0598	1.1140	.0849
Trade	1.1229	.1152	.1295	.1773	.1186	.1240
Finance, Insurance & Real Estate	.2682	.2570	.1872	.1469	.2109	.2492
Services	.2184	1.2362	1.1726	1.1314	.1983	1.2911
Government Enterprises & Other	.0099	.0093	.0050	.0037	.0059	.0098
Households	.6935	.6180	.5088	.4676	.6089	.6799
Total Gross Output Multiplier	2.4892	2.4885	2.1701	2.0514	2.3250	2.5305

Source: Estimated by Applied Economic Systems, Inc., June 1985.

Table 3-30

Total Direct, Indirect and Induced Multipliers for Coastal Recreation-Related Expenditures

County: San Francisco

	Retail Trade	Hotels & Lodging Places	Eating & Drinking Places	Auto Repair & Services	Trans-portation	Other Services
Agric., Forestry & Fisheries	.0038	.0069	.0149	.0033	.0040	.0040
Mining	.0013	.0018	.0011	.0008	.0012	.0011
Construction	.0202	.0430	.0185	.0169	.1127	.0235
Manufacturing	.0754	.0863	.1900	.0670	.0738	.0751
Communication & Utilities	.1147	.1618	.1023	.1019	1.2599	.1054
Trade	1.0766	.0748	.1039	.1568	.0893	.0764
Finance, Insurance & Real Estate	.1879	.1909	.1414	.0999	.1446	.1635
Services	.1916	1.2187	1.1645	1.1164	.1598	1.2336
Government Enterprises & Other	.0104	.0104	.0066	.0043	.0061	.0122
Households	.3415	.3110	.2805	.2483	.3515	.3283
Total Gross Output Multiplier	2.0234	2.1056	2.0237	1.8356	2.2329	2.0231

Source: Estimated by Applied Economic Systems, Inc., June 1985.

Table 3-31

Total Direct, Indirect and Induced Multipliers for Coastal Recreation-Related Expenditures

County: San Mateo

	Retail Trade	Hotels & Lodging Places	Eating & Drinking Places	Auto Repair & Services	Trans-portation	Other Services
Agric., Forestry & Fisheries	.0058	.0099	.0136	.0041	.0051	.0060
Mining	.0002	.0002	.0002	.0001	.0002	.0002
Construction	.0292	.0559	.0251	.0213	.0222	.0336
Manufacturing	.0909	.1053	.1889	.0805	.0815	.1083
Communication & Utilities	.0877	.1082	.0844	.0785	1.1672	.0951
Trade	1.1498	.1433	.1835	.2314	.1470	.1547
Finance, Insurance & Real Estate	.2477	.2395	.1912	.1475	.1792	.2214
Services	.2292	1.2544	1.2029	1.1552	.2319	1.2664
Government Enterprises & Other	.0105	.0100	.0063	.0045	.0050	.0108
Households	.7175	.6467	.5868	.5204	.6432	.6936
Total Gross Output Multiplier	2.5685	2.5734	2.4829	2.2435	2.4825	2.5901

Source: Estimated by Applied Economic Systems, Inc., June 1985.

Table 3-32

Total Direct, Indirect and Induced Multipliers for Coastal Recreation-Related Expenditures

County: Santa Cruz

	Retail Trade	Hotels & Lodging Places	Eating & Drinking Places	Auto Repair & Services	Trans-portation	Other Services
Agric., Forestry & Fisheries	.0156	.0200	.0406	.0112	.0137	.0167
Mining	.0004	.0006	.0004	.0003	.0004	.0004
Construction	.0270	.0533	.0219	.0187	.0276	.0326
Manufacturing	.0688	.0731	.1169	.0522	.0554	.0702
Communication & Utilities	.1132	.1574	.0938	.0784	1.1996	.1063
Trade	1.1330	.1227	.1381	.1835	.1438	.1345
Finance, Insurance & Real Estate	.2075	.1902	.1472	.1146	.1581	.1904
Services	.2003	1.2094	1.1542	1.1244	.1968	1.2292
Government Enterprises & Other	.0101	.0095	.0053	.0039	.0061	.0101
Households	.6858	.6046	.5164	.4654	.6572	.6691
Total Gross Output Multiplier	2.4617	2.4408	2.2348	2.0526	2.4587	2.4595

Source: Estimated by Applied Economic Systems, Inc., June 1985.

Table 3-33

Total Direct, Indirect and Induced Multipliers for Coastal Recreation-Related Expenditures

County: Monterey

	Retail Trade	Hotels & Lodging Places	Eating & Drinking Places	Auto Repair & Services	Trans-portation	Other Services
Agric., Forestry & Fisheries	.0154	.0187	.0434	.0103	.0147	.0151
Mining	.0135	.0176	.0104	.0085	.0123	.0114
Construction	.0282	.0535	.0245	.0211	.0799	.0315
Manufacturing	.0647	.0599	.1526	.0400	.0548	.0579
Communication & Utilities	.1331	.1707	.1165	.1077	1.1875	.1143
Trade	1.1467	.1364	.1762	.2217	.1715	.1451
Finance, Insurance & Real Estate	.2189	.2023	.1627	.1255	.1754	.1927
Services	.2193	1.2342	1.1834	1.1398	.2313	1.2400
Government Enterprises & Other	.0104	.0097	.0059	.0042	.0065	.0101
Households	.7008	.6169	.5540	.4931	.7434	.6599
Total Gross Output Multiplier	2.5510	2.5199	2.4296	2.1719	2.6773	2.4780

Source: Estimated by Applied Economic Systems, Inc., June 1985.

Table 3-34

Total Direct, Indirect and Induced Multipliers for Coastal Recreation-Related Expenditures

County: San Luis Obispo

	Retail Trade	Hotels & Lodging Places	Eating & Drinking Places	Auto Repair & Services	Trans-portation	Other Services
Agric., Forestry & Fisheries	.0110	.0149	.0345	.0076	.0092	.0124
Mining	.0084	.0097	.0072	.0060	.0109	.0073
Construction	.0260	.0517	.0202	.0182	.0446	.0286
Manufacturing	.0967	.0934	.0974	.0787	.1136	.0855
Communication & Utilities	.1313	.1718	.0962	.0852	1.1944	.1124
Trade	1.1314	.1191	.1296	.1807	.1204	.1303
Finance, Insurance & Real Estate	.1973	.1783	.1353	.1098	.1318	.1788
Services	.2010	1.2005	1.1466	1.1235	.1572	1.2163
Government Enterprises & Other	.0107	.0099	.0055	.0043	.0059	.0107
Households	.6888	.5964	.4947	.4645	.5467	.6667
Total Gross Output Multiplier	2.5026	2.4457	2.1672	2.0785	2.3347	2.4490

Source: Estimated by Applied Economic Systems, Inc., June 1985.

Table 3-35

Total Direct, Indirect and Induced Multipliers for Coastal Recreation-Related Expenditures

County: Santa Barbara

	Retail Trade	Hotels & Lodging Places	Eating & Drinking Places	Auto Repair & Services	Trans- portation	Other Services
Agric., Forestry & Fisheries	.0111	.0152	.0235	.0083	.0125	.0122
Mining	.0077	.0091	.0073	.0057	.0093	.0074
Construction	.0263	.0483	.0223	.0206	.1114	.0298
Manufacturing	.0825	.0838	.1281	.0723	.0997	.0865
Communication & Utilities	.0923	.1129	.0796	.0872	1.1673	.0911
Trade	1.1322	.1225	.1363	.1853	.1557	.1355
Finance, Insurance & Real Estate	.2285	.2183	.1692	.1327	.1879	.2094
Services	.2481	1.2657	1.2002	1.1600	.2698	1.2877
Government Enterprises & Other	.0118	.0119	.0068	.0051	.0078	.0121
Households	.6654	.5934	.5161	.4742	.7338	.6626
Total Gross Output Multiplier	2.5059	2.4811	2.2894	2.1514	2.7552	2.5343

Source: Estimated by Applied Economic Systems, Inc., June 1985.

Table 3-36

Total Direct, Indirect and Induced Multipliers for Coastal Recreation-Related Expenditures

County: Ventura

	Retail Trade	Hotels & Lodging Places	Eating & Drinking Places	Auto Repair & Services	Trans-portation	Other Services
Agric., Forestry & Fisheries	.0099	.0141	.0257	.0070	.0091	.0106
Mining	.0081	.0102	.0066	.0050	.0090	.0069
Construction	.0220	.0448	.0178	.0154	.0261	.0236
Manufacturing	.0846	.0966	.1350	.0667	.0791	.0987
Communication & Utilities	.0967	.1234	.0750	.0636	1.1498	.0803
Trade	1.1374	.1273	.1453	.1923	.1410	.1363
Finance, Insurance & Real Estate	.1971	.1856	.1434	.1123	.1538	.1763
Services	.2125	1.2245	1.1726	1.1301	.1973	1.2458
Government Enterprises & Other	.0153	.0176	.0093	.0064	.0098	.0136
Households	.6994	.6196	.5341	.4769	.6363	.6740
Total Gross Output Multiplier	2.4830	2.4637	2.2648	2.0757	2.4113	2.4661

Source: Estimated by Applied Economic Systems, Inc., June 1985.

Table 3-37

Total Direct, Indirect and Induced Multipliers for Coastal Recreation-Related Expenditures

County: Los Angeles

	Retail Trade	Hotels & Lodging Places	Eating & Drinking Places	Auto Repair & Services	Trans-portation	Other Services
Agric., Forestry & Fisheries	.0118	.0154	.0313	.0113	.0131	.0130
Mining	.0104	.0113	.0159	.0121	.0139	.0108
Construction	.0224	.0395	.0212	.0180	.0333	.0259
Manufacturing	.3373	.3632	.5684	.4247	.4449	.3610
Communication & Utilities	.1034	.1162	.0995	.0949	1.2250	.1040
Trade	1.1674	.1596	.2111	.2578	.1849	.1698
Finance, Insurance & Real Estate	.2937	.2860	.2475	.1946	.2496	.2750
Services	.3249	1.3386	1.3009	1.2379	.3311	1.4137
Government Enterprises & Other	.0149	.0159	.0109	.0081	.0101	.0148
Households	.7294	.6624	.6554	.5806	.7225	.7093
Total Gross Output Multiplier	3.0156	3.0081	3.1621	2.8400	3.2284	3.0973

Source: Estimated by Applied Economic Systems, Inc., June 1985.

Table 3-38

Total Direct, Indirect and Induced Multipliers for Coastal Recreation-Related Expenditures

County: Orange

	Retail Trade	Hotels & Lodging Places	Eating & Drinking Places	Auto Repair & Services	Trans-portation	Other Services
Agric., Forestry & Fisheries	.0095	.0136	.0223	.0076	.0090	.0103
Mining	.0010	.0012	.0009	.0008	.0012	.0010
Construction	.0294	.0532	.0250	.0224	.0318	.0323
Manufacturing	.1660	.1870	.2602	.2203	.1516	.1934
Communication & Utilities	.0781	.0944	.0707	.0708	1.1413	.0812
Trade	1.1700	.1611	.1929	.2497	.1794	.1724
Finance, Insurance & Real Estate	.2856	.2761	.2210	.1824	.2272	.2577
Services	.2764	1.2904	1.2303	1.1963	.2689	1.3168
Government Enterprises & Other	.0137	.0146	.0088	.0069	.0083	.0133
Households	.7775	.7022	.6376	.5970	.7449	.7583
Total Gross Output Multiplier	2.8072	2.7938	2.6697	2.5542	2.7636	2.8367

Source: Estimated by Applied Economic Systems, Inc., June 1985.

Table 3-39

Total Direct, Indirect and Induced Multipliers for Coastal Recreation-Related Expenditures

County: San Diego

	Retail Trade	Hotels & Lodging Places	Eating & Drinking Places	Auto Repair & Services	Trans-portation	Other Services
Agric., Forestry & Fisheries	.0124	.0163	.0374	.0093	.0115	.0137
Mining	.0005	.0007	.0006	.0004	.0006	.0005
Construction	.0289	.0547	.0241	.0203	.0303	.0323
Manufacturing	.1012	.1029	.1718	.1026	.0988	.1115
Communication & Utilities	.0975	.1211	.0774	.0714	1.1262	.0939
Trade	1.1372	.1274	.1477	.1935	.1382	.1388
Finance, Insurance & Real Estate	.2363	.2251	.1764	.1351	.1756	.2125
Services	.2589	1.2710	1.2101	1.1624	.2432	1.2930
Government Enterprises & Other	.0109	.0103	.0063	.0046	.0066	.0113
Households	.6858	.6100	.5420	.4812	.6245	.6710
Total Gross Output Multiplier	2.5706	2.5395	2.3938	2.1808	2.4555	2.5785

Source: Estimated by Applied Economic Systems, Inc., June 1985.

Employment effects by industrial sector are estimated from the total gross output changes in each sector. This is accomplished by dividing the gross output change by the average output-per-worker in the given sector. Those average values were derived from information from the U.S. Bureau of Labor Statistics. Income changes, in turn, are calculated by multiplying the employment effects in each sector by the average annual income of employees in that sector. Those average income figures were derived from information specific to the State of California, provided by the U.S. Bureau of Economic Analysis. Both sets of values used are presented in Table 3-40.

5. Model Output

Output is produced for each geopiece and each county where the model projects a drop in non-local participation in any of the four activities. Table 3-41 provides an example of this information. It shows participation by the three categories of origins for those negatively-impacted places. Specifically, the table shows participation by both day use and overnight visitors from outside the local county, as well as participation by county residents.

Also presented for negatively-impacted places is a table of expenditures by economic sector: retail trade, hotels and lodging places, eating and drinking places, auto repair and services, transportation, and other services. These expenditures are shown separately for California residents and out-of-state visitors. Potential revenues to local jurisdictions due to sales and use taxes, as well as transient lodging taxes, are also output by the model for all negatively-impacted geopieces and counties. Together, these make up the direct economic effects of coastal recreation.

A second table shows the direct, indirect and induced economic effects for negatively-impacted counties, but not geopieces. These include effects on total gross output (dollars spent), employment, and income for the nine major industrial sectors of the economy: (1) agriculture, forestry and fisheries; (2) mining; (3) construction; (4) manufacturing; (5) transportation, communication and utilities; (6) trade; (7) finance, insurance and real estate; (8) services; and (9) government enterprises. Table 3-42 shows an example of this information.

For all effects output by the model, a table is presented for the baseline case, the impact case, the difference between the two cases, and the percentage difference over annual baseline effects.

D. Consumer Surplus Model

1. Introduction

The installation of an offshore oil platform adjacent to an existing recreation area can change the enjoyment or utility accruing to recreationists who visit a site, and may thereby change the number of people who come. An integral part of this study is to determine the demand for and value of coastal recreational sites before and after offshore development. In the case of recreation, however, there are no existing markets to adequately price the value of a change in the environment. In response to this lack of observable recreation markets, recreation economists have developed several techniques to infer the demand for recreation sites. These techniques have been reviewed in Chapter II.

The main objective of techniques used to measure the economic value of recreation sites is to estimate a demand curve for that site. The demand curve

Table 3-40

Output Per Worker and Average Annual Income Per Worker in California by Major Industrial Sector, in 1982 dollars.

Sector	Output per Worker 1	Average Annual Income 2
Agriculture, Forestry & Fisheries	56,272	27,303
Mining	283,905	35,272
Construction	87,285	29,777
Manufacturing	101,244	25,304
Transportation, Communication, and Utilities	106,343	29,551
Trade	35,287	15,745
Finance, Insurance and Real Estate	131,720	21,610
Services	40,645	19,154
Government	37,714	18,308

Sources: Estimated from data an U.S. output and employment by the U.S. Bureau of labor Statistics, and data an California employment and income by the U.S. Bureau of Economic Analysis, Regional Economic Information System.

Notes:

1. Calculated as total U.S. output by sector in 1982, divided by total U.S. wage and salary employment in that sector.

2. Calculated as total California income (including proprietors' income) by sector in 1982, divided by total California wage and salary employment in that sector.

Table 3-41
BASELINE ECONOMIC EFFECTS
Proportion of year: 1.0000

(Monetary values in 1982 dollars)

Geopiece # 241

Participation in Coastal Recreation by California Residents

Category	Visitors to County: Day Use	Visitors to County: Overnight	County Residents	TOTAL
Boating	4468.	7347.	1854.	13670.
Fishing	23650.	41001.	7974.	72626.
Water Dep. Beach	12744.	15502.	6362.	34607.
Water Ehh. Beach	10738.	25607.	4863.	41207.

Direct Expenditures by Tourists Engaged in Coastal Recreation

Expenditure Category	Expenditures ($) by Origin: California	Out-of-State	Total
Retail Trade	817615.	425127.	1242742.
Hotels & Lodging	1560653.	1224082.	2784734.
Eating & Drinking Places	998264.	432303.	1430567.
Auto Repair & Services	1471160.	631117.	2102277.
Transportation	25218.	12599.	37817.
Other Services	1032359.	460977.	1493337.
TOTAL	5905268.	3186206.	9091474.

Potential Revenues ($) to Local Jurisdictions (by above Direct Spending)

From Sales and Use Taxes: 59113.
From Transient Lodging Taxes: 222779.

Table 3-42

ECONOMIC EFFECTS --- BASELINE (Monetary values in 1982 dollars)

Proportion of year: 1.0000

County: Santa Barbara

Participation in Coastal Recreation by California Residents

Category	Visitors to County: Day Use	Visitors to County: Overnight	County Residents	TOTAL
Boating	65273.	177962.	43561.	286796.
Fishing	169027.	442185.	93574.	704786.
Water Dep. Beach	389332.	846892.	345142.	1581366.
Water Enh. Beach	318831.	1041207.	216540.	1576578.

Direct Expenditures by Tourists Engaged in Coastal Recreation

Expenditure Category	Expenditures ($) by Origin: California	Out-of-State	Total
Retail Trade	17152650.	11754490.	28907150.
Hotels & Lodging	39677400.	35715190.	75392590.
Eating & Drinking Places	17732530.	9882420.	27614950.
Auto Repair & Services	23219850.	12536940.	35756800.
Transportation	585044.	384009.	969053.
Other Services	13090320.	7256289.	20346610.
TOTAL	111457800.	77529340.	188987200.

otential Revenues ($) to Local Jurisdictions (by above Direct Spending)

From Sales and Use Taxes: 1057218.

From Transient Lodging Taxes: 6031407.

otal (Direct, Indirect and Induced) Impacts from Spending by Tourists Engaged in Coastal Recreation

utput Category	Output ($)	Employment	Income ($)
gric., Forestry & Fisheries	2672912.	47.5	1296888.
ining	1473638.	5.2	183083.
onstruction	6468406.	74.1	2206676.
anufacturing	16682030.	164.8	4169353.
ommunication & Utilities	19480850.	183.2	5413413.
rade	55261760.	1566.1	24657710.
nance, Insurance & Real Estate	36923530.	280.3	6057679.
ervices	203679400.	5011.2	95984140.
overnment Enterprises & Other	1862170.	49.4	903978.
OTAL	344504700.	7381.7	140872900.

shows the number of people who would visit a site for any given price. The area under the estimated demand curve and above the price line represents the monetary benefits to recreationists of being able to obtain all their desired recreation for a nominal entrance fee when they would have been willing to pay a higher price. This willingness to pay more than the actual cost is known as consumer surplus. Figure 3-12 shows the demand for a site D, and the actual entry fee charged, P. Consumer surplus is represented by the shaded area. The economic value of a change in the environment can be determined by the difference in consumer surplus before and after the proposed environmental change.

To determine the change in consumer surplus due to the construction of offshore oil platforms adjacent to existing beaches, the demand function for the current recreation site must first be estimated. As explained in Chapter II, the demand function can be determined directly or indirectly.

The indirect method used in this study to determine demand for nonpriced recreation services is the travel cost method. The objective of the travel cost method is to infer the demand function for each recreation site by examining how visitor numbers respond to varying travel costs. This approach recognizes that recreationists incur expenses in time and money by traveling to a site, and these costs per trip serve as a proxy for the non-existent price of a visit. By observing the participation originating from each of a variety of geographic origins, an estimate of the relationship between a site's travel-cost, or "price", and quantity used can be determined.

2. Travel Cost Method of Estimating Consumer Surplus

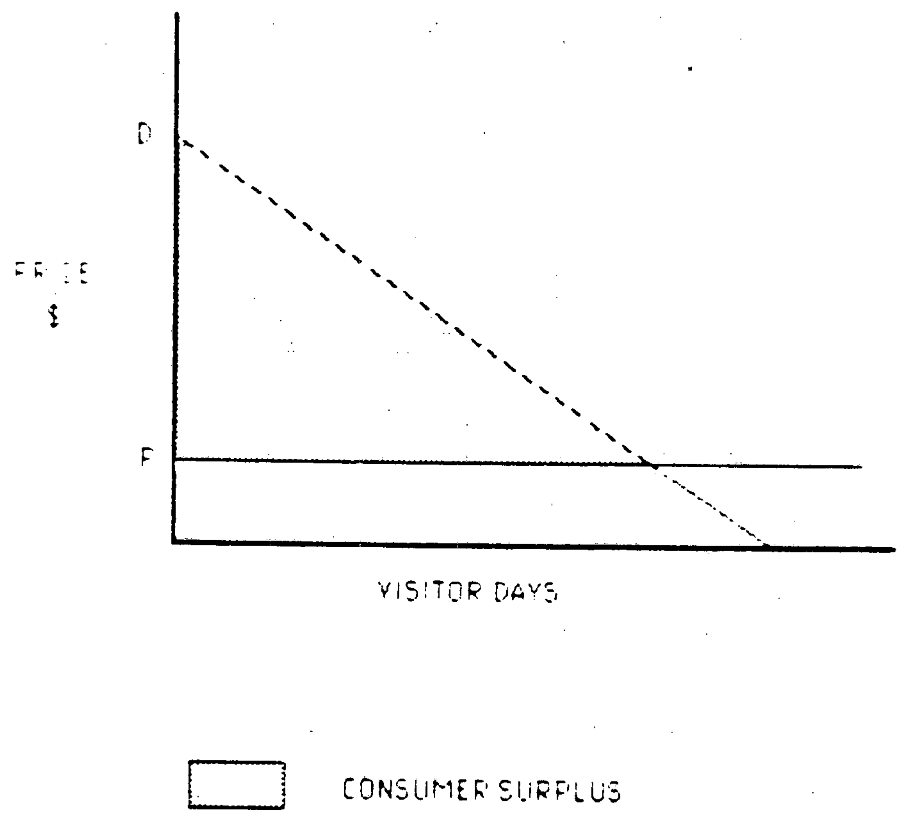
The first step in the travel cost method is to estimate site visitation as a function of travel cost and other explanatory variables. The second step is to derive the implied economic value of the site from the estimated visitation equation. The accuracy of the estimation depends upon the relationship between the true demand function and the estimated visitation equation, as well as on the procedure for estimating the area under the demand curve. In the first step, model specification and functional forms are issues which have attracted researcher's attention (Allen and Stevens, 1981; Burt and Brewer, 1971; Cesario and Knetsch, 1970; Gum and Martin, 1975; Smith, 1975; Ziemer, Musser, Hill, 1980). Linear, quadratic, double log and, most frequently, semilog functional forms have been used in empirical applications. However, linear specifications are often employed for computational and analytical ease.

An additional problem in specifying any demand equation is the choice of an appropriate set of regressors. Distance, travel cost, and travel time have been incorporated into various demand functions in order to capture the price of the recreational experience. Researchers have shown that the opportunity cost of time plays an important role and if only monetary travel expenses are used in the analysis, the resulting benefit estimates are underestimated. This bias is caused by assuming the only factors affecting variation in trips from different origins are the differences in money outlays. The time required to travel, however, may be another factor contributing to the variation in trips. One of the issues when incorporating travel time is determining the appropriate value to place on this time.

In the second step, two approaches have been used to determine a site's economic value. Either the area under an aggregate demand is determined (Cesario and Knetsch, 1970; Grubb and Goodwin, 1968; Knetsch, Brown, Hansen,

FIGURE 3-12

CONSUMER SURPLUS



1976), or a demand curve for the site from each origin is derived and then aggregated across origins (McConnell and Norton, 1976; Menz and Wilton, 1983). In either case the area under one or several demand curves must be approximated. One procedure to approximate the area under a demand curve is accomplished by cumulatively summing the number of visits as the hypothetical fee incrementally increases from zero to the fee where demand becomes zero (Gum and Martin, 1975; Sutherland, 1983). An alternative method is to determine consumer surplus by taking the definite integral of the visitation equation between the limits of the actual travel costs and the maximum willingness to pay for each origin.

3. Estimation of Current Consumer Surplus for an Activity in a Given Geopiece

Stage One: Specifying the Visitation Equation. The number of visits from the various counties to a geopiece is obtained from the gravity model, which determines the number of recreationists traveling from each county to each geopiece for each of the four different activities. This travel pattern for each coastal segment is the basis for estimating a geopiece's demand curve for each activity. In general, the demand equation is a function of travel costs:

$$T_{ijk} = f(TC_{ij})$$

where

T_{ijk} = number of trips from county i to geopiece j for activity k;

TC_{ij} = travel costs incurred in traveling from county i to geopiece j;

Travel costs are in turn a function of the travel-time between the origin and destination. If all the recreation trips were one-day trips, the travel cost per visitor day would take into account the round-trip travel time, as follows:

$$TC^*_{ij} = (D_{ij}/3) * 2 * \{(40 * .1328/3.4) + 1.7633\} = \$2.2171\ D_{ij}$$

where

TC^*_{ij} = travel costs from i to j, assuming a one-day trip

D_{ij} = travel time from i to j in 20 minute units

3 = factor to change 20 minute units to fractional hours

40 = average miles per hour

2 = round trip factor

\$.1328 = average marginal operating cost per vehicle per mile

3.4 = average number of passengers per vehicle

\$1.7633 = opportunity cost of travel time, dollars per hour

Overnight trips would imply a lower travel-cost per visitor-day, as the round trip costs were spread over multiple days.

In order to construct a precise travel-cost function requires travel-cost data for individuals travelling from a variety of distances, or at least the distribution of length of stay according to distance travelled. Unfortunately, the CDPR data set includes only a breakdown between local, day-trips and overnight trips for each activity. This breakdown does show that a substantial portion of each activity represents overnight trips:

ACTIVITY	Boating	Fishing	Water-Dependent	Water-Enhanced
LOCAL	37.7%	47.4%	62.6%	37.9%
DAY-TRIPS	11.6%	14.5%	16.6%	20.6%
OVERNIGHT TRIPS	50.6%	38.1%	20.8%	41.5%

Source: Arnold, Robert K., Vol. II, 1982, p. 27.

Recreationists make too many overnight trips for us to assume all daytrips when calculating travel costs. However, data showing length of stay for various distance trips is not available. Therefore, we devised a method to determine travel costs based on an estimated distribution of trip length by travel time.

A quadratic form was used to allow a diminishing function of travel-time:

$$TC_{ij} = a\ D_{ij}^{2} + b\ D_{ij} + c$$

where

TC_{ij} = travel costs from i to j

D_{ij} = travel time from i to j

a, b, c = quadratic parameters

The parameters a, b, c were estimated by fitting the quadratic equation through 3 points:

(1) The origin. This is necessary to reflect zero travel costs at zero distance.

(2) A cost one-half way between the cost of a one-day trip and a two-day trip, at the travel time corresponding to the distance that accounts for the proportion of trips which are either "local" or "day-trips." This distance is found by determining the distance from the origin (on the distance-decay function) where the proportion of trips at that distance or shorter distances equals the proportion of trips that are local, or day-trips. The rationale for choosing this point is that it is at this distance that trips would change from one-day to two-day trips, if all the day-trips were the shortest ones and all the overnight trips were the longest. To avoid a discontinuous function we assume that one-half of the trips at this distance are day-trips and one-half are overnight, and use this point in fitting a smooth function.

(3) The third point is a cost representing a two-day trip at a distance sufficiently far to insure that most trips are accounted for (400 minutes). This is necessary to avoid an earlier downturn in the travel-cost function, which could even result in negative travel costs at extreme distances. The peak in the function thus specified occurs between 515 minutes and 557 minutes away, depending on the activity. The quadratic function was fitted through these three points by recognizing that forcing the curve through the origin implies that c = 0, and then by solving simultaneous equations to find a and b. The equation for each activity group is as follows:

Parameter	Boating	Fishing	Water-Dependent	Water-Enhanced
a	-0.0311	-0.0315	-0.0351	-0.0327
b	1.7296	1.7379	1.8115	1.7620
c	0	0	0	0

These equations are then used to calculate travel costs (TC_{ij}) for any travel time (D_{ij}) between origin i and coastal geopiece j.

<u>Data Sources:</u> The travel times from each county to each geopiece are the same as reported in the trip distribution model described earlier.

The marginal costs of operating a car were determined from data collected by the United States Department of Transportation and reported by the GSA (U.S. General Services Administration, 1980). A ten year average marginal cost was used in order to consider a range of car ages, rather than just the expense of operating a new car. The operating costs includes repairs and maintenance, gasoline, oil, taxes on gas and tires, and sales tax on operating costs. The fixed ownership costs of depreciation, accessories, insurance, garaging and titling were not included. The operating cost was determined for 1979. The consumer price index was used to update the cost to 1982 dollars.

The travel costs are assumed to be shared by the number of passengers in the vehicle. The 3.4 passengers per vehicle represents the average number of vehicle passengers taken from a sample of persons per vehicle reported by State parks (California Department of Parks and Recreation, 1980).

Travel costs are assumed to include variable monetary costs and the cost of travel time. The opportunity cost of travel time is assumed to be one-third the California average hourly wage. The average wage is based on Census Bureau data for 1979 (U.S. Census Bureau, 1983 City and County Data Book) updated to 1982 dollars using the consumer price index. Recreation economists debate the correct percentage of wages to use as the opportunity cost of travel time, with zero and 100% as the extreme positions. Our choice of one-third the average wage rate is in keeping with previous estimates using one-fourth to one-half of the average wage rate as the opportunity cost of recreation travel-time (Cesario, 1976; Menz and Wilton, 1983; U.S. Water Resources Council, 1983).

Other variables that can affect the number of trips demanded include some measure of the price of substitutes. A virtue of the trip distribution model, however, is that each geopiece is considered a substitute for every other geopiece and the model distributes trips to all substitutes by weighing travel distances and relative attraction. Because of this feature of the trip distribution model, it is not necessary to include a measure of substitutes in the estimation of the demand function for a specific site.

According to economic theory, the quantity of a good demanded should depend on a budget constraint. Our visitation equation was initially specified with income included as an explanatory variable. During test runs, however, mean household income did not significantly contribute to the explanatory power of the model and therefore was omitted from the final specification.

The visitation demand equation can be specified either in terms of per capita visitation rates or number of visits. Visitation rates are calculated by dividing the number of trips from a county to a geopiece by that county's population. Alternatively, if the visitation demand equation uses the number of trips as the dependent variable, then county population becomes an explanatory variable. In order to determine which specification provides a better fit of the data, both specifications were tried. However, because the alternatively specified demand equations are based on different quantity variables, rate and number, a direct comparison of the R^2 is not fruitful in comparing specifications. Instead, the residuals of the rate specification estimation can be converted to number of trips, placing residuals from both specifications on a comparable basis. With this conversion, the specification that provides the lower sum of squared residuals is preferred.

Rather than performing separate tests for each activity at each geopiece, however, one dependent variable specification is used consistently for all demand equations. Visitation rate is chosen as the preferred dependent variable because in 40 of the 168 estimated demand curves with the number of visits as the dependent variable, population was not a significant explanatory variable. These results indicate visitation rates will be more consistent in providing a model with significant explanatory variables.

For the functional form of the regression equation we rejected the logarithmic form because many of the counties are estimated as having zero trips. In such cases the dependent variable, the log of zero, is undefined. In the past, researchers have sometimes either discarded zero valued dependent variable observations or entered an arbitrarily small number in place of zero when using a logarithmic functional form. Both practices, however, provide biased estimates of the coefficients. We have, therefore, assumed linear demand equations.

$$\frac{T_{ijk}}{Pop_i} = B_{0jk} + B_{1jk}(TC_{ij}) + u_{ijk}$$

where

T_{ijk} = number of visitors from county i to geopiece j for activity k;

Pop_i = the population of county i;

TC_{ij} = travel costs incurred in traveling from county i to geopiece j;

B_{rjk} = estimated coefficients; and

u_{ijk} = error term.

Stage Two: Estimating the Visitation Equation. In this model the desire of recreationists in different origins to make a trip to a specific destination depends on the distance between the origin and destination. If the distance is close enough, the model sends people from an origin to the destination. If the distance between some origin and destination is beyond some threshold, however, the model simply sends zero people from that origin to that destination. The model sends zero people whether the distance is 1 mile or 200 miles beyond the threshold. This feature of the model affects the estimation of the dependent variable, visitation rates, in the travel cost equation. The dependent variable only varies for those origin-destinations pairs within some threshold distance of each other. For all other origin-destination pairs the value of the dependent variable is zero. Under such circumstances, the sample is said to be censored because we do not observe variance in our dependent variable over the entire range. Thus our model is:

$$\frac{T_{ijk}}{Pop_i} = B'X_i + e, \quad \text{if } T_{ijk} > 0$$

$$\frac{T_{ijk}}{Pop_i} = 0, \quad \text{otherwise.}$$

Ordinary least squares estimation (OLS) encounters two problems with such a censored sample. If we use OLS on a censored sample which includes the zero-valued observations, the estimated parameters will be biased. However, if we used OLS on just the observations with $T_{ijk}>0$, the expectation of the error term is not zero [the condition $\frac{T_{ijk}}{Pop_i}>0$ is equivalent to $e > -B'X$ and $E(e|e>-BX)\neq 0$] causing least squares estimates to be biased.

Estimation techniques have been developed, however, for such limited dependent variable samples (Tobin, 1958; Amemiya, 1973; Heckman, 1976). The procedure we chose for our estimation is the method developed by Tobin and is based on the maximum likelihood principle to estimate the parameters. The likelihood function describes the probability of obtaining the sample observed. The maximum likelihood estimates are those values which maximize this function and they are known to have the desirable properties of consistency and minimum variance among all consistent estimators.

The results of the estimation procedure for the various activities in several geopieces are reported in Table 3-43 to Table 3-46. The results confirm a priori expectations. The coefficients exhibit the anticipated signs and are statistically significant.

Stage Three: Estimating the Area under the Demand Curve. The net economic value of the geopiece to recreationists in county i is found by taking the definite integral of the estimated visitation equation between the current price and the price at which demand becomes zero, or the maximum price. In our model the current price is interpreted as the cost of traveling to the specified geopiece, and the maximum price is defined as travel cost plus a maximum fee. The maximum fee, F, which can be added to the existing travel cost before

TABLE 3-43
ESTIMATED DEMAND CURVES AND CONSUMER SURPLUS
WATER-DEPENDENT ACTIVITIES

Geopiece	Coefficients (t-ratio beneath) Cost	Intercept	R Square	------Total----- Consumer Surplus	Confidnc Interval	--Per Capita-- Consumr Surplus	Conf. Intrvl
3	-0.0061 -2.5439	0.118 1.8113	0.332	$32,791	$54,044	$1.16	$1.92
4	-0.011 -3.7497	0.2063 3.4568	0.269	$211,943	$128,600	$2.65	$1.61
8	-0.0027 -7.2276	0.0554 7.233	0.638	$115,591	$43,420	$4.40	$1.65
137	-0.0056 -7.5197	0.1316 5.4477	0.614	$6,647,468	$1,456,189	$7.73	$1.69
138	* (* indicates San Francisco Bay location)						
140	-0.0256 -7.0078	0.5353 8.5253	0.542	$40,443,530	$8,665,990	$9.74	$2.09
204	-0.0005 -7.7328	0.0104 8.19	0.666	$225,874	$53,937	$7.15	$1.71
209	-0.0053 -7.7797	0.1053 8.0661	0.719	$1,205,387	$292,351	$6.02	$1.46
241	-0.001 -7.5442	0.0194 7.436	0.725	$211,711	$73,916	$6.12	$2.14
311	-0.0027 -5.8332	0.0494 5.2061	0.720	$1,742,066	$684,213	$4.76	$1.90
319	-0.0037 -2.1273	0.0391 1.1006	0.259	$3,153	$11,313	$0.27	$0.99
320	-0.0187 -3.5091	0.36 3.4125	0.259	$396,404	$242,207	$2.67	$1.63
321	-0.0137 -4.5539	0.3736 4.4441	0.407	$461,548	$210,956	$3.50	$1.60
322	-0.0036 -5.2738	0.07 5.043	0.500	$72,106	$29,523	$3.32	$1.36
325	-0.0002 -7.022	0.0035 7.0142	0.610	$9,396	$4,055	$4.49	$1.94
326	-0.0031 -5.719	0.053 6.8374	0.584	$185,990	$74,089	$5.24	$2.09
327	-0.0438 -6.7252	0.8997 6.8862	0.614	$3,743,554	$1,307,040	$6.00	$2.09
328	-0.0026 -5.8275	0.0529 6.3073	0.633	$171,083	$59,235	$4.42	$1.53
362	-0.0128 -7.9629	0.2757 8.5572	0.574	$6,991,146	$1,540,960	$7.15	$1.58
364	*						
369	-0.0005 -7.7546	0.0116 8.339	0.611	$354,960	$84,780	$7.25	$1.73
370	-0.017 -6.5889	0.4052 8.1272	0.490	$24,059,970	$5,544,121	$10.06	$2.32

TABLE 3-43
ESTIMATED DEMAND CURVES AND CONSUMER SURPLUS
WATER-DEPENDENT ACTIVITIES

Geopiece	Coefficients (t-ratio beneath) Cost	Intercept	R Square	------Total------ Consumer Surplus	Confidnc Interval	--Per Capita-- Consumr Surplus	Conf. Intrvl
371	*						
375	*						
376	-0.0113 -7.7789	0.2586 8.9103	0.636	$14,459,380	$2,873,836	$3.82	$1.71
378	*						
381	*						
410	-0.2014 -8.8377	0.028 9.01	0.776	$718,304	$144,847	$5.87	$1.14
411	-0.0136 -8.1301	0.4138 8.5033	0.710	$15,071,380	$2,951,046	$7.35	$1.44
413	-0.0098 -7.3436	0.1344 8.2847	0.621	$5,382,254	$1,240,509	$7.75	$1.78
414	-0.0147 -7.5343	0.2853 8.0528	0.677	$6,150,117	$1,445,451	$7.31	$1.72
420	-0.0203 -6.8456	0.3823 6.8851	0.695	$3,059,869	$1,227,780	$8.47	$2.56
421	-0.07 -6.5793	1.3854 6.7757	0.637	$20,031,020	$7,227,038	$8.11	$2.87
431	-0.2205 -7.4637	0.0107 7.3436	0.751	$80,931	$20,355	$5.23	$2.02
432	-0.201 -7.5212	0.0187 7.2287	0.725	$242,827	$84,321	$6.02	$2.15
433.1	-0.0289 -7.1484	0.157 7.0158	0.551	$3,297,171	$1,141,304	$7.56	$2.62
433.2	-0.0179 -7.1333	0.2584 6.8801	0.647	$6,592,078	$2,227,080	$8.07	$2.73
433.3	-0.0038 -7.6468	0.0836 7.3714	0.707	$2,052,405	$539,152	$7.38	$2.48
435	-0.2207 -7.5901	0.0112 7.0034	0.748	$408,448	$139,251	$7.20	$2.38
437	-0.2089 -7.9481	0.1656 7.642	0.763	$8,592,799	$2,355,456	$7.79	$2.14
438	-0.0025 -8.2075	0.047 7.7742	0.843	$2,617,313	$698,412	$7.22	$1.92
439	-0.0443 -8.7486	0.8959 8.5824	0.899	$67,937,930	$14,995,670	$8.27	$1.75
440.1	-0.0925 -8.9753	1.9408 9.9509	0.974	$174,793,400	$34,792,790	$8.27	$1.85
440.2	-0.0094 -8.7004	0.1917 8.5321	0.861	$15,915,130	$3,444,734	$7.67	$1.56

TABLE 3-43
ESTIMATED DEMAND CURVES AND CONSUMER SURPLUS
WATER-DEPENDENT ACTIVITIES

Geopiece	Coefficients (t-ratio beneath) Cost	Coefficients (t-ratio beneath) Intercept	R Square	Total Consumer Surplus	Total Confidnc Interval	Per Capita Consumr Surplus	Per Capita Conf. Intrvl
440.3	-0.0135 -3.6725	0.2754 8.5019	0.358	$23,569,460	$5,110,923	$7.61	$1.65
448	-0.0678 -8.5211	1.3922 8.3869	0.360	$130,026,300	$28,116,000	$7.24	$1.56
449	-0.01 -7.3566	0.1863 7.3266	0.847	$12,868,910	$3,574,889	$6.20	$1.72
457	-0.0522 -5.0531	0.384 5.2882	0.498	$35,105,670	$16,652,970	$5.28	$2.51
458	-0.0351 -5.5553	1.3423 4.6319	0.431	$37,676,870	$22,364,690	$4.84	$2.87
TOTAL CONSUMER SURPLUS				$674,025,504			

TABLE 3-44
ESTIMATED DEMAND CURVES AND CONSUMER SURPLUS
WATER-ENHANCED ACTIVITIES

Geopiece	Coefficients (t-ratio beneath)		R	------Total-----		--Per Capita--	
	Cost	Intercept	Square	Consumer Surplus	Confidnc Interval	Consumr Surplus	Conf. Intrvl
3	-0.0258 -3.5169	0.4949 3.0853	0.494	$244,598	$176,573	$2.93	$2.11
4	-0.0244 -6.2342	0.5009 6.1227	0.675	$674,466	$215,588	$4.56	$1.46
9	-0.0071 -7.5273	0.1454 7.6066	0.735	$389,654	$132,801	$4.13	$1.41
137	-0.0185 -9.2039	0.4081 9.7956	0.833	$14,221,590	$2,466,493	$6.72	$1.17
138	* (* indicates San Francisco Bay location)						
140	-0.0571 -9.3918	1.2409 10.089	0.940	$67,926,250	$11,371,520	$7.64	$1.31
204	-0.0011 -8.2487	0.021 8.7251	0.779	$487,460	$104,558	$6.64	$1.40
206	-0.0129 -7.6447	0.2624 7.9399	0.735	$3,293,123	$793,368	$5.61	$1.33
241	-0.0008 -7.6352	0.0153 7.9187	0.731	$251,612	$75,751	$6.35	$1.84
311	-0.0016 -7.514	0.035 7.1133	0.823	$1,809,435	$540,509	$5.51	$1.55
319	-0.0118 -2.9405	0.2006 2.3677	0.406	$66,930	$73,735	$1.95	$2.04
320	-0.0445 -5.1993	0.9195 6.1089	0.673	$1,256,874	$401,340	$4.57	$1.46
321	-0.0439 -6.5533	0.9044 6.5073	0.714	$1,374,640	$437,775	$4.88	$1.59
322	-0.0095 -6.667	0.1935 6.5393	0.707	$241,589	$80,565	$4.29	$1.43
325	-0.0003 -8.4325	0.0065 8.5367	0.812	$26,706	$8,121	$4.31	$1.22
326	-0.0052 -8.0969	0.1096 8.2992	0.766	$523,387	$142,501	$4.49	$1.22
327	-0.0784 -8.2719	1.7014 8.5407	0.797	$11,081,150	$2,597,229	$4.79	$1.12
328	-0.0061 -8.4487	0.1305 8.5217	0.826	$634,613	$150,565	$3.85	$0.87
362	-0.027 -9.1632	0.5899 9.6748	0.839	$16,133,640	$2,399,259	$6.27	$1.13
364	*						
369	-0.0012 -9.2427	0.0243 9.6403	0.838	$773,264	$144,463	$6.42	$1.20
370	-0.0353 -9.1566	0.7735 9.9278	0.816	$39,997,200	$6,364,355	$7.96	$1.37

TABLE 3-44
ESTIMATED DEMAND CURVES AND CONSUMER SURPLUS
WATER-ENHANCED ACTIVITIES

Geopiece	Coefficients (t-ratio beneath) Cost	Intercept	R Square	------Total----- Consumer Surplus	Confidnc Interval	--Per Capita-- Consumr Surplus	Conf. Intrvl
371	*						
375	*						
376	-0.0247 -9.5279	0.5354 10.136	0.861	$27,087,340	$4,499,717	$7.39	$1.23
378	*						
381	*						
410	-0.0034 -8.8493	0.0719 9.3378	0.932	$2,007,000	$370,807	$5.78	$1.07
411	-0.0464 -8.7561	0.94 9.3462	0.817	$32,233,140	$6,042,399	$6.71	$1.26
413	-0.0185 -8.4681	0.3878 9.04	0.794	$10,551,230	$2,116,310	$6.77	$1.36
414	-0.0325 -7.8643	0.6459 8.3521	0.750	$13,663,440	$3,068,265	$6.55	$1.47
420	-0.0157 -7.336	0.3196 7.5047	0.719	$4,081,479	$1,275,657	$6.73	$2.10
421	-0.0569 -7.3261	1.1833 7.5447	0.706	$21,952,560	$6,551,937	$7.35	$2.19
431	-0.0004 -7.7305	0.0079 7.8709	0.729	$114,267	$34,748	$6.17	$1.88
432	-0.0007 -7.9259	0.0143 7.9743	0.740	$294,407	$81,363	$6.55	$1.81
433.1	-0.0061 -7.8039	0.1223 7.8831	0.728	$3,347,193	$904,884	$7.36	$1.99
433.2	-0.0098 -7.9158	0.1782 7.9522	0.732	$6,329,748	$1,617,406	$8.14	$2.08
433.3	-0.0024 -8.2759	0.0477 8.2888	0.777	$1,924,399	$468,727	$8.02	$1.95
435	-0.0004 -8.3146	0.0076 8.0276	0.803	$375,578	$97,545	$7.57	$1.97
437	-0.0057 -8.6073	0.1169 8.6142	0.815	$7,596,848	$1,653,792	$8.20	$1.79
438	-0.0017 -8.8285	0.034 8.6967	0.863	$2,373,495	$510,209	$7.87	$1.69
439	-0.0309 -9.2616	0.6609 9.2622	0.902	$56,296,400	$10,702,940	$8.39	$1.60
440.1	-0.0642 -9.5628	1.4121 9.7021	0.899	$139,715,900	$24,559,850	$8.56	$1.50
440.2	-0.0066 -9.3062	0.142 9.2779	0.896	$13,045,170	$2,472,115	$8.01	$1.52

TABLE 3-44
ESTIMATED DEMAND CURVES AND CONSUMER SURPLUS
WATER-ENHANCED ACTIVITIES

Geopiece	Coefficients (t-ratio beneath) Cost	Intercept	R Square	------Total----- Consumer Surplus	Confidnc Interval	--Per Capita-- Consumr Surplus	Conf. Intrvl
440.3	-0.0095 -9.2776	0.2025 9.2503	0.693	$19,142,920	$3,636,058	$7.98	$1.52
448	-0.0452 -9.3559	1.0049 9.3914	0.912	$104,217,600	$19,047,060	$7.71	$1.41
449	-0.005 -8.9399	0.1289 8.8648	0.897	$11,649,400	$2,311,118	$7.11	$1.41
457	-0.0271 -7.0173	0.5649 6.9375	0.693	$36,576,680	$10,166,520	$6.37	$1.77
458	-0.038 -6.1846	0.7576 5.9355	0.615	$38,969,570	$13,637,600	$6.67	$2.05
TOTAL CONSUMER SURPLUS				$714,966,783			

TABLE 3-45
ESTIMATED DEMAND CURVES AND CONSUMER SURPLUS
BOATING ACTIVITIES

Geopiece	Coefficients (t-ratio beneath) Cost	Intercept	R Square	------Total----- Consumer Surplus	Confidnc Interval	---Per Capita--- Consumer Surplus	Confidnc Interval
3	-0.003 -4.6882	0.0515 3.3833	0.658	$22,333	$13,714	$3.74	$2.30
4	* (* indicates no boating facilities available in geopiece)						
5	-0.0005 -7.1647	0.0084 7.1516	0.621	$9,039	$3,154	$3.13	$1.09
137	-0.0013 -8.1319	0.0222 8.4056	0.837	$435,225	$101,357	$4.71	$1.10
138	-0.0021 -6.6396	0.0379 8.3885	0.863	$1,346,242	$284,934	$5.37	$1.14
140	-0.0002 -6.1507	0.0036 8.4173	0.884	$111,101	$24,743	$5.21	$1.16
224	*						
229	*						
241	-0.0005 -7.1201	0.0075 7.0196	0.713	$68,131	$27,202	$4.93	$1.39
311	*						
319	-0.0067 -4.0561	0.114 3.3114	0.567	$39,031	$30,274	$2.84	$2.20
320	-0.0056 -6.5312	0.1036 6.114	0.732	$110,022	$36,915	$5.07	$1.70
321	-0.0071 -6.789	0.1312 6.3523	0.734	$152,587	$48,409	$5.51	$1.75
322	*						
325	*						
326	*						
327	-0.0029 -7.2879	0.0556 7.2584	0.722	$149,154	$57,145	$3.97	$1.52
328	-0.0003 -7.0561	0.0059 7.1037	0.800	$10,762	$3,739	$3.03	$1.05
362	-0.0019 -7.9167	0.032 8.2032	0.847	$441,010	$104,076	$4.50	$1.06
364	-0.0017 -8.1702	0.0297 8.4587	0.810	$834,585	$200,116	$5.47	$1.31
369	-0.0014 -8.1328	0.0234 8.4066	0.837	$457,527	$106,516	$4.71	$1.10
370	*						

TABLE 3-45
ESTIMATED DEMAND CURVES AND CONSUMER SURPLUS
BOATING ACTIVITIES

Geopiece	Coefficients (t-ratio beneath) Cost	 Intercept	R Square	------Total----- Consumer Surplus	 Confidnc Interval	---Per Capita--- Consumer Surplus	 Confidnc Interval
371	-0.0042 -8.073	0.0723 8.3604	0.796	$2,416,556	$570,051	$5.67	$1.34
375	-0.0029 -9.4508	0.0496 8.7544	0.846	$1,958,071	$422,821	$5.66	$1.22
376	-0.0013 -8.4033	0.0229 8.8894	0.840	$791,234	$173,498	$5.43	$1.19
378	-0.0026 -9.2457	0.0636 9.6355	0.825	$2,442,295	$528,817	$5.57	$1.21
381	-0.0039 -9.5202	0.0711 8.9392	0.843	$3,049,429	$630,029	$5.73	$1.19
410	*						
411	-0.0032 -7.5584	0.0582 7.9054	0.726	$1,394,700	$360,253	$5.86	$1.51
413	-0.0031 -7.3901	0.0524 7.8951	0.697	$958,826	$270,765	$5.89	$1.66
414	-0.0037 -6.9048	0.0647 6.99	0.638	$913,560	$292,619	$6.13	$1.96
420	*						
421	-0.0065 -6.8806	0.1153 6.6147	0.601	$1,095,307	$490,059	$6.24	$2.79
431	*						
432	*						
433.1	-0.0004 -7.8183	0.0091 7.4332	0.776	$98,563	$33,499	$5.89	$2.02
433.2	-0.0042 -7.8771	0.0744 7.6678	0.768	$1,788,102	$547,666	$6.97	$2.14
433.3	*						
435	*						
437	-0.0047 -8.0647	0.0842 7.6555	0.801	$4,195,052	$1,181,093	$6.99	$1.97
438	*						
439	-0.0003 -7.6051	0.0053 7.2428	0.909	$301,588	$85,441	$6.48	$1.83
440.1	-0.0044 -8.6149	0.0836 8.2762	0.900	$6,667,673	$1,540,069	$7.13	$1.65
440.2	*						

TABLE 3-45
ESTIMATED DEMAND CURVES AND CONSUMER SURPLUS
BOATING ACTIVITIES

Geopiece	Coefficients (t-ratio beneath) Cost	Intercept	R Square	------Total----- Consumer Surplus	Confidnc Interval	---Per Capita--- Consumer Surplus	Confidnc Interval
440.3	-0.0045 -8.6658	0.0574 8.3699	0.903	$7,092,419	$1,597,972	$6.79	$1.53
448	-0.0043 -8.3449	0.0812 7.8944	0.897	$6,888,900	$1,684,460	$6.40	$1.57
449	-0.0027 -7.8823	0.0499 7.3209	0.885	$3,413,254	$956,550	$5.67	$1.59
457	-0.0027 -6.7125	0.0418 5.9408	0.679	$1,463,962	$635,044	$4.51	$1.96
458	-0.0069 -6.3846	0.1068 5.5074	0.640	$3,058,495	$1,485,352	$4.42	$2.15
	TOTAL CONSUMER SURPLUS			$54,174,714			

TABLE 3-46
ESTIMATED DEMAND CURVES AND CONSUMER SURPLUS
FISHING ACTIVITIES

Geopiece	Coefficients (t-ratio beneath) Cost	Intercept	R Square	------Total----- Consumer Surplus	Confidnc Interval	---Per Capita--- Consumer Surplus	Confidnc Interval
3	-0.0065 -4.329	0.0358 3.1572	0.614	$29,391	$25,866	$4.27	$3.39
4	-0.0069 -5.4511	0.1266 4.9573	0.410	$131,310	$56,700	$4.65	$2.01
9	-0.0022 -7.4051	0.0418 7.3137	0.752	$58,902	$23,128	$5.39	$2.12
137	-0.0018 -8.259	0.0382 8.7567	0.684	$1,184,682	$268,991	$7.53	$1.71
138	-0.004 -5.5579	0.0861 6.3045	0.289	$4,340,939	$1,335,547	$10.30	$3.17
140	-0.0028 -7.6085	0.0532 6.5664	0.629	$3,563,179	$783,239	$8.78	$1.93
204	-0.0032 -6.9172	0.0611 7.3884	0.595	$1,327,261	$362,037	$7.70	$2.10
208	-0.0016 -7.0659	0.0308 7.2205	0.535	$300,596	$90,451	$6.20	$1.57
241	-0.0021 -7.2059	0.239 7.1024	0.597	$475,033	$161,028	$6.54	$2.49
311	-0.0035 -6.9261	0.058 6.1541	0.646	$2,149,384	$595,650	$5.22	$2.10
319	-0.0055 -3.8425	0.0748 2.5626	0.545	$13,345	$17,584	$2.62	$3.53
320	-0.0069 -5.4511	0.1266 4.9573	0.410	$131,310	$56,700	$4.65	$2.01
321	-0.005 -6.2754	0.1143 5.9906	0.559	$140,192	$48,977	$5.34	$1.87
322	-0.0039 -5.7233	0.0747 5.3932	0.649	$78,096	$25,326	$4.35	$1.61
325	-0.0032 -6.7222	0.0536 6.5566	0.587	$129,510	$62,032	$7.20	$3.35
326	-0.003 -6.7075	0.056 6.6237	0.619	$98,010	$48,095	$7.10	$3.49
327	-0.0027 -6.5709	0.0496 6.4657	0.575	$115,218	$54,719	$6.73	$4.14
328	-0.0013 -6.3332	0.0246 6.1622	0.548	$45,996	$23,515	$7.08	$3.62
362	-0.0021 -7.2531	0.0409 7.6651	0.562	$789,258	$217,913	$7.44	$2.06
364	-0.0039 -5.7436	0.0809 5.9925	0.309	$3,275,293	$1,032,102	$10.51	$3.31
369	-0.0018 -8.259	0.0382 8.7567	0.684	$1,184,682	$268,991	$7.53	$1.71
370	-0.0031 -7.3412	0.066 6.2445	0.555	$3,324,574	$809,409	$9.09	$2.21

TABLE 3-46
ESTIMATED DEMAND CURVES AND CONSUMER SURPLUS
FISHING ACTIVITIES

Geocode	Coefficients (t-ratio beneath) Cost	Intercept	R Square	------Total------ Consumer Surplus	Confidnc Interval	---Per Capita--- Consumer Surplus	Confidnc Interval
371	-0.0020 -7.0924	0.0569 8.0595	0.517	$3,383,674	$853,655	$9.30	$2.35
375	-0.0032 -7.047	0.0722 8.2239	0.521	$4,387,461	$1,042,398	$9.44	$2.24
376	-0.0025 -9.5293	0.053 9.1278	0.738	$2,667,359	$555,171	$7.90	$1.63
378	-0.0029 -7.9341	0.0512 6.7546	0.645	$3,190,162	$624,225	$8.04	$1.73
381	-0.0033 -6.9247	0.0723 8.1923	0.505	$4,306,291	$1,010,559	$9.14	$2.15
410	-0.0016 -7.9893	0.0135 8.2779	0.705	$835,522	$151,129	$5.32	$1.26
411	-0.0029 -7.478	0.0534 7.8904	0.634	$1,630,916	$291,828	$6.39	$1.68
413	-0.0035 -6.7891	0.0554 7.0395	0.554	$1,644,735	$448,760	$7.84	$2.14
414	-0.0030 -7.1557	0.0594 7.4311	0.622	$1,200,481	$283,397	$7.24	$2.05
420	-0.0041 -6.9237	0.0741 6.8342	0.571	$479,277	$207,213	$5.74	$2.48
421	-0.0041 -6.8657	0.0749 6.8833	0.520	$820,338	$353,122	$7.19	$3.09
431	-0.0027 -6.9453	0.0436 6.6808	0.556	$531,481	$217,192	$6.82	$2.79
432	-0.0019 -7.5555	0.0328 7.4256	0.677	$505,444	$172,074	$6.47	$2.20
433.1	-0.0021 -7.748	0.0377 7.5705	0.722	$722,747	$237,222	$5.82	$2.24
433.2	-0.0025 -7.3249	0.048 7.9266	0.737	$1,121,597	$351,150	$7.28	$2.29
433.3	-0.0027 -8.1515	0.0437 7.9393	0.789	$1,501,674	$446,347	$7.41	$2.07
435	-0.0031 -7.8399	0.0572 7.4223	0.744	$2,626,764	$800,233	$7.18	$2.19
437	-0.0031 -7.9427	0.0576 7.4587	0.750	$3,033,958	$900,048	$7.11	$2.11
438	-0.0032 -7.6955	0.0593 7.2579	0.712	$3,204,236	$1,056,577	$6.75	$2.16
439	-0.0039 -7.9971	0.0683 7.3458	0.924	$4,402,462	$1,283,528	$6.98	$2.02
440.1	-0.0048 -7.0764	0.0813 6.2436	0.587	$5,278,749	$1,994,056	$6.66	$2.52
440.2	-0.0046 -6.8769	0.078 6.071	0.537	$4,752,646	$1,880,650	$6.42	$2.54

TABLE 3-46
ESTIMATED DEMAND CURVES AND CONSUMER SURPLUS
FISHING ACTIVITIES

Geopiece	Coefficients (t-ratio beneath) Cost	Intercept	R Square	------Total----- Consumer Surplus	Confidnc Interval	---Per Capita--- Consumer Surplus	Confidnc Interval
440.3	-0.0047 -6.3436	0.0304 6.1401	0.556	$5,146,515	$1,975,691	$6.44	$2.47
448	-0.0047 -7.6982	0.0808 6.9437	0.799	$5,812,750	$1,811,677	$6.12	$1.91
449	-0.0042 -7.5759	0.072 6.8952	0.796	$4,443,917	$1,420,291	$5.81	$1.86
457	-0.0063 -6.1575	0.0955 5.1135	0.416	$2,989,976	$1,558,421	$5.40	$3.00
456	-0.0083 -5.8637	0.1234 4.7795	0.403	$3,089,704	$1,042,460	$5.72	$3.49
TOTAL CONSUMER SURPLUS				$35,424,639			

demand is zero is found by setting the estimated demand equal to zero and solving. The maximum fee for activity k in recreational geopiece j is thus defined:

$$F_{jk} = \frac{-B_{ojk}}{B_{1jk}}$$

The consumer surplus is thus defined:

$$\int_{TC_{ij}}^{F_{jk}} (B_{ojk} + B_{1jk} P)dp = B_{ojk}(P) + 1/2\ B_{1jk}\ (P)^2 \Big|_{TC_{ij}}^{F_{jk}}$$

where

P = price of one visit.

The total consumer surplus for geopiece j for activity k is computed by summing the county consumer surpluses. The consumer surplus, or net economic value, for each activity at each geopiece is shown in Tables 3-43 to 3-46.

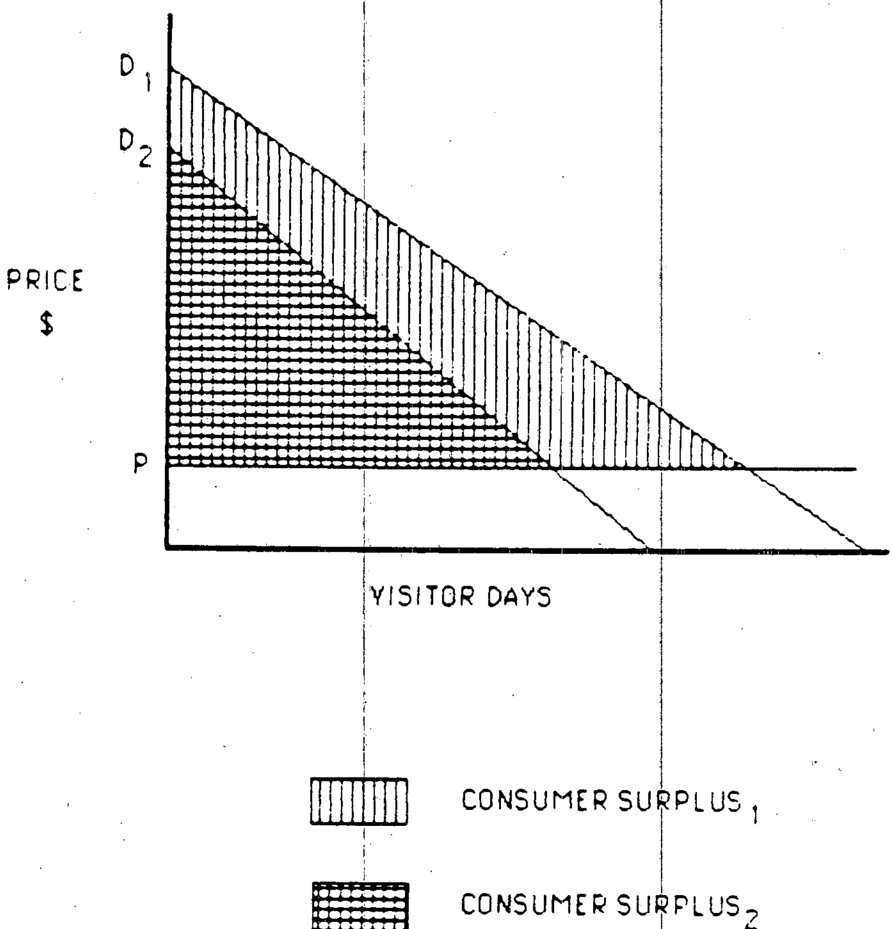
Confidence intervals for the estimated consumer surplus are also reported. These intervals are determined using the reported variance-covariance matrix of each Tobit estimation procedure to estimate the variance of the consumer surplus estimate. The estimated standard error, the square root of the estimated consumer surplus variance, is then multiplied by the appropriate z value for the desired level of confidence. In this case we are reporting 90% confidence intervals so the appropriate z value is 1.64.

As stated earlier, the economic value of a change in the environment due to offshore development can be determined by the difference in consumer surplus before and after the proposed environmental change. To estimate the change in consumer surplus, demand curves are first estimated for a base case and then reestimated from the new travel patterns associated with OCS related change in the environment. In the gravity model recreation travel patterns are a function of site characteristics, and when there is a change in a geopiece's characteristics there will be a change in travel patterns. This change in travel patterns is estimated by the gravity model using new attractiveness indices reflecting the changed environment. Thus, all OCS related changes in the environment must be translated into a change in the attractiveness index of a geopiece.

The loss in consumer surplus due to OCS related environmental change for each activity is determined using the reestimated demand curves. Figure 3-13 shows how a demand curve for a geopiece might shift given a decline in environmental quality. The vertical hatched area under D_1 represents the base case consumer surplus. The horizontal hatched area under D_2 represents consumer surplus associated with the changed environment. The demand schedule for the affected geopiece moves inward reflecting a decline in demand and a loss of consumer surplus. The loss in consumer surplus to recreationists due to OCS related

FIGURE 3-13

CHANGE IN CONSUMER SURPLUS FROM SHIFT IN DEMAND CURVE



changes in the environment is measured by the area above the price line and between the new and initial demand curves for the affected geopiece.

The demand schedules for geopieces unaffected by the OCS changes in the environment can either remain the same or shift outward. If a geopiece is a substitute for a geopiece with increased OCS development, then the demand curve for the unaltered geopiece will shift outward. This increase in demand at substitute geopieces does not enter the calculations determining the loss in consumer surplus resulting from OCS changes in the environment (Mishan, 1976; Knetsch, 1977; Cesario and Knetsch, 1976; Freeman, 1979; Sutherland, 1982).

For each application, the model will report the decline in consumer surplus associated with each geopiece that is affected by the OCS related change in the environment.

4. Model Output

Total consumer surplus, summed over origins, is output for each activity in each negatively-impacted geopiece. Consumer surplus is calculated for both the baseline and the impact cases, and both are printed on the same table. See Table 3-47 for an example. Also shown on the same table is the difference between baseline and impact consumer surplus and the percent difference over annual baseline. The output tables also bracket that figure by presenting the (+ or -) 90 percent confidence interval associated with each estimate.

The consumer surplus per person for both the baseline and the impact case is also presented. This value is calculated as the total consumer surplus divided by the sum of baseline trips. It is also bracketed by the 90 percent confidence interval.

In addition, the Tobit regression coefficients are displayed, along with their associated t-statistics. The coefficient of determination, R^2, is also presented for both the baseline and impact cases.

Table 3-47

TRAVEL COST MODEL -- STAGE 2 RESULTS

Project: Northern Santa Barbara County (Pt.Pedernales)
Proportion of year: 1.0000

Water-dependent Beach Activities

Geopiece # 241

	Baseline	Baseline + Impact	Impact
Total:			
Consumer Surplus	211711.	202449.	-9262.
Confidence Interval	73916.	71396.	
Per cent over Annual Baseline			-4.37
Per Person:			
Consumer Surplus	6.12	6.00	-.12
Confidence Interval	2.14	2.11	
Per cent over Annual Baseline			-1.98
Statistics:			
Cost coefficient	-.0010	-.0010	
t-ratio	-7.5442	-7.5517	
Constant Coefficient	.0191	.0189	
t-ratio	7.4360	7.4327	
R-squared	.7251	.7308	

APPENDIX A: BIBLIOGRAPHY

BIBLIOGRAPHY

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Arnold, Robert K., Stephen Levy, and Theresa Wilkenson Carey. Recreation Activity in California and Ten Regions of the State -- 1980, Volume I, prepared for Planning Division, California State Department of Parks and Recreation, Center for Continuing Study of the California Economy, June, 1982.

This study, in two volumes, summarizes recreation survey results and projects recreational activity in California to the year 2000. Four seasonal household surveys were conducted between summer, 1978 and spring, 1980, each covering about 1000 California residents. Respondents were surveyed about participation in various recreation activities, type of occasion (near home, day trip or overnight), time traveled, type of facility (government or non-government), effect of the cost of gasoline, and a variety of socioeconomic factors. The authors used data from the survey to project recreation patterns to the year 2000.

Arnold, Robert K., Stephen Levy, and Victoria Nourse. Recreation Activity in California and Ten Regions of the State -- 1980-2000, Volume II, prepared for Planning Division, California State Department of Parks and Recreation, Center for Continuing Study of the California Economy, June, 1982.

Arthur D. Little, Inc. Union Oil Project/Exxon Project Shamrock and Central Santa Maria Basin Area Study EIS/EIR, Final Report, Volume 2. Prepared for County of Santa Barbara, U.S. Minerals Management Service, California State Lands Commission, California Coastal Commission, and California Office of Offshore Development. Santa Barbara, CA: Arthur D. Little, Inc., June, 1985.

Arthur Young and Company. Boating Resources Development Planning Study, report to California Department of Navigation and Ocean Development, October, 1973.

This is a planning and data compilation study designed to assist the newly established (in 1969) California Department of Navigation and Ocean Development. The study inventories boating facilities existing in 1970, presents cross tabular analysis of boating registration data, and assesses future demand for boating facilities. Although somewhat dated, this study is the most recent attempt by a state agency to evaluate boating patterns in California.

Association of Monterey Bay Area Governments. AMBAG Economic Base Study Summary Report.

This and The Visitor Sector are two of six reports constituting an economic study of Santa Cruz and Monterey counties. The study was designed to provide a data base for evaluating the local economy and to develop forecasts of local economic activity. The study especially focuses on a few significant sectors, including tourism. The volume entitled The Visitor Sector reports the results of a visitor spending survey from 1978.

Association of Monterey Bay Area Governments. The Visitor Sector. Prepared for AMBAG by Recht Hausrath and Associates.

Baker, Earl, Stephen West, Dennis Moss, and James Weyant. "Impact of Offshore Nuclear Power Plants: Forecasting Visits to Nearby Beaches," Environment and Behavior 12 (September 1980) 367-407.

The authors asked beach users about their intention to avoid a beach if hypothetical energy facilities were built near the shore. This kind of information may be useful in estimating impacts of such facilities although it does not reflect what people actually do after the fact. About one quarter of the respondents said they would not return to the beach if a nuclear generating station were located three miles offshore, but the authors thought this was an overestimate of avoidance behavior. The authors also analyzed attendance at state parks near coastal nuclear plants but did not find any consistent change in behavior associated with the beginning of commercial operation of a nearby nuclear power plant. The authors concluded that several methods of ascertaining impacts of large scale projects on recreation behavior are necessary as no one measure is completely reliable.

Batty, M., and S. Mackie. "The Calibration of Gravity, Entropy and Related Models of Spatial Interaction," Environment and Planning, 4 (1972) 205-233.

The authors review the family of trip distribution models — unconstrained, production-attraction constrained, and attraction constrained and production constrained models. This paper is concerned with calibrating the models. It compares five methods for solving maximum likelihood equations used in calibrating trip distribution models.

Baxter, M.J., and G.O. Ewing. "Calibration of Production - Constrained Trip Distribution Models and the Effect of Intervening Opportunities," Journal of Regional Science, 19 (1979) 319-330.

Using recreation data from a previous study of northeastern Pennsylvania, the authors investigated the properties of a production-constrained trip distribution model. Variations on the model included Tanner's function, a power function, and an exponential function. All versions of the model include distance from the recreationists' county of residence to the park in question. The authors concluded that the choice of a distance function has little influence on model performance. In general, the various versions of the models fit the data rather poorly.

Berssen, William, ed. The Pacific Boating Almanac, Northern California and Nevada, 1985 edition. Ventura, CA: Western Marine Enterprises, 1985.

Bishop, Richard, Thomas Haberlein, and Mary Jo Kelly. "Contingent Valuation of Environmental Assets: Comparisons with Simulated Market," Natural Resources Journal 23 (1983) 619-633.

This study compares consumer surplus for hunting trips using contingent market methods (willingness to pay, willingness to sell) and a simulated market in which hunters actually could sell their goose hunting permits. The different methods produce very different results and different versions of the same method (such as take-it-or-leave-it willingness to sell and open ended willingness to sell) yield different results. This leads the authors to conclude that studies which use only one or two methods to measure recreationists' consumer surplus are of suspect accuracy. Large biases can occur when asking hypothetical questions such as willingness to pay or sell.

Bonnieux, F. and P. Rainelli. "Oil Spills and Tourism: Case Study of the Amoco Cadiz," in Organization for Economic Cooperation and Development, The Cost of Oil Spills, Paris, 1982.

To estimate the impact of the Amoco Cadiz oil spill on the Brittany economy, the authors looked at times series data on motor fuel consumption, wages in tourist related industries, and deliveries of flour to bakeries. Decreases in these measures suggest a decline in tourism of around ten percent in Brittany during the summer as a result of the oil spill. The method is indirect but it suggests the magnitude of the impacts in the absence of data on actual tourist activities.

Bouwes, Nicolaas and Robert Schneider. "Procedures in Estimating Benefits of Water Quality Change," American Journal of Agricultural Economics 61 (Aug., 1979) 535-539.

Brown, Gardner. "Estimating Non-Market Economic Losses from Oil Spills," in Organization for Economic Cooperation and Development, The Cost of Oil Spills, Paris, 1982.

Using the travel cost method, Brown attempted to estimate the loss of consumer surplus attributable to the Amoco Cadiz oil spill in Brittany. The data available were quite rough and the model was unsophisticated in its choice of independent variables. The author compared the results of the travel cost method with willingness to drive to clean beaches (based on photographs of beaches) and found that the willingness to drive yielded far greater values per person for unpolluted beaches than the travel cost method.

Brown, Gardner, Richard Congar, and Elizabeth Witman. "Recreation: Tourist and Residents," in National Ocean Service, Chapter 4.

Brunswick County. North Carolina Board of County Commissions. Beach Community Recreational Resources and Economic Activities and their Vulnerability to Coastal Oil Spills, 1982.

This report reviews the importance of natural resources in community development, stressing coastal resources. A variety of economic data are provided on coastal recreation activity in Brunswick County. Potential impacts of oil spills are evaluated as well. The report is not particularly useful for this study as it uses data specific to Brunswick County and is descriptive rather than analytical.

Burt, Oscar R., and Durward Brewer. "Estimation of Net Social Benefits from Outdoor Recreation," Econometrica, 39 (1971), 813-827.

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California Department of Parks and Recreation. "Ocean and Beach Activities 1980-2000," Recreation Activity Profile Report No. 15, October 1983.

This report summarizes 1980 recreation activities of Californians based on in-home surveys of over 4000 individuals. Participation in various types of ocean and beach activities is given in days per capita and annual participation days. Breakdowns by season, travel time, age, income, and other variables are reported. The typical ocean and beach recreationist is male, white, 12 to 35 years of age, with an annual household income greater than $35,000, having at least some college education, and employed in a managerial or professional position. Ocean swimming is the most popular ocean and beach activity. This is a very useful report for understanding California recreation activities.

California Department of Parks and Recreation. Statistical Report Fiscal Year 1976-1977. Sacramento: State of California, 1977.

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Cheshire, P., and M. Stabler. "Joint Consumption Benefits in Recreational Site 'Surplus'" Regional Studies 10 (1976) 343-351.

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Ditton, Robert, Alan Graefe, and Anthony Fedler. "Predicting Marine Recreational Fishing Patterns from Boat Characteristics and Equipment," Transactions of the American Fisheries Society 109 (1980) 644-648.

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David M. Dornbusch & Company. The Impact of Water Resource Quality Improvements on Residential Property Prices, prepared for the National Commission on Water Quality. San Francisco: David Dornbusch & Company, 1975.

Drake, Ronald. "A Short-Cut to Estimates of Regional Input-Output Multipliers: Methodology and Evaluation," International Regional Science Review Vol.2 (Fall 1976) 1-17.

The author devised a method for estimating regional multipliers when input output models are not available. This method was incorporated in a model called RIMS I which was subsequently replaced by RIMS II, a more sophisticated model. Drake estimated multipliers by applying location quotients to the national technology matrix to obtain first round impacts; subsequent round impacts were established by regressing multipliers from existing regional models on characteristics of the region such as the proportion of earnings from manufacturing sectors. These regression equations were used to estimate the portion of the multiplier beyond the first round of impacts. The article emphasizes the regression analyses. The RIMS I model should not be used as RIMS II and other more sophisticated models are now readily available.

Dwyer, John, John Kelly, and Michael Bowes. Improved Procedures for Valuation of the Contribution of Recreation to National Economic Development. Urbana, Illinois: University of Illinois Water Resources Center, 1977.

The authors reviewed the concept of the economic value of recreation and various methods proposed for making economic valuations of recreation activities. They concentrated on the travel cost method and willingness to pay methods. This is an excellent review of the literature up to the mid 1970s and it has been widely cited. The authors concluded that the travel cost method and willingness to pay method were both acceptable and that unit day value methods should be abandoned.

Environmental Law Institute. The Use of Economic Analysis in Valuing Natural Resource Damage, Report to the National Oceanic and Atmospheric Administration, National Ocean Service, 1984.

Flegg, A.T. "Methodological Problems in Estimating Recreational Demand Functions and Evaluating Recreational Benefits," Regional Studies, 10 (1976) 353-362.

Analyzing data from recreationists at a reservoir in Wales, Flegg compared different specifications of gravity type models using the relationship between visits from the origin zone to the reservoir and cost per visit, income, and population of the origin zone. He found that the level of disaggregation of origin zones makes a large difference in the estimated distance decay of visits and hence on economic valuations using the travel cost method. He concluded that one should use spatially disaggregated data. He also concluded that one should not use visits per capita as the measure of visitation in gravity type models. This assumes the exponent of population is -1. Rather one should include population as an independent variable and specify the dependent variable in terms of visits, allowing the statistical procedure to determine the coefficient or exponent of population.

Fricke, Peter, and John Maiolo. "Public Knowledge and Perceptions of the Effects of the Argo Merchant Oil Spill," in In the Wake of the Argo Merchant, Proceedings of a Symposium, Center for Ocean Management Studies, University of Rhode Island, January, 1978.

This study describes a survey of residents of Cape Cod, Nantucket, and Martha's Vineyard concerning people's reactions to the Argo Merchant oil spill and another oil spill. About 69 percent of the respondents were poorly informed or uninformed about the Argo Merchant spill. The study also reviewed the impacts of the Argo Merchant spill on recreation and found no impact. The authors concluded that perceptions of environmental impacts need to be incorporated into planning and information efforts.

Gramann, James. "An Ex Post Facto Analysis of the Regional Economic Impact of Expenditures for Reservoir Recreation," Journal of Environmental Management 16 (1983) 357-367.

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Greater Los Angeles Visitors and Convention Bureau (GLAVCB). Los Angeles Tourism: Facts and Figures. Los Angeles, CA: GLAVCB, 1985.

Grigalunas, Thomas, et al. "The Tourist Industry," in National Ocean Service, National Oceanic and Atmospheric Administration, Assessing the Social Costs of Oil Spills: The Amoco Cadiz Case Study, July 1983.

This study attempted to measure the economic impact of the Amoco Cadiz oil spill on the recreation industry in Brittany. The authors estimated several models of the value of real wage payments over time for several regions in France and for several sectors of the economy (e.g. retail food, hotels). In one version of the model, population, temperature deviations from the average, rainfall deviations from the average, time, and real income per capita were included as independent variables along with a dummy variable for the season with the oil spill. Time series data for the period 1962 to 1979 were used. Because of the difficulty obtaining precise measures of the variables desired the method was limited in its success. However, the oil spill did seem to decrease tourist activities throughout much of coastal Brittany.

Grubb, Herbert W., and James T. Goodwin. "Economic Evaluation of Water-Oriented Recreation in the Preliminary Texas Water Plan." Austin, TX: Texas Water Development Board Rep. No. 84, 1968.

Gruen Gruen & Associates. A Socio-Economic Analysis of California's Sport and Commercial Fishing Industries, report to The State of California Resources Agency. June, 1982.

Gum, Russell, and William Martin. "Problems and Solutions in Estimating the Demand for and Value of Rural Outdoor Recreation," American Journal of Agricultural Economics 57 (November 1975) 558-566.

The methodology used by Gum and Martin has been widely cited in the literature. The authors obtained recreation data from a mail survey of Arizona households. The demand for recreation by each household (measured as number of trips for each of several activities) was determined using regression analysis, with household characteristics, trip cost, and other variables as independent variables. The demand for resource values was approximated using the travel cost method and the consumer surplus for hunting and fishing activities was calculated. The authors argue that to obtain the aggregate demand for each activity, one should sum individual household demand curves, not scale up the average individual's demand curve.

Havran, Kenneth J. Pacific Summary Report, September 1983, Outer Continental Shelf Oil and Gas Activities in the Pacific and Their Onshore Impacts. Prepared by Rogers, Golden & Halpern for the Outer Continental Shelf Oil and Gas Information Program, Minerals Management Service, Department of the Interior. Reston, VA: Minerals Management Service, 1983.

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Haynes, Kingsley E., and A. Stewart Fotheringham. Gravity and Spatial Interaction Models, Grantlan Thrall, ed., Vol. 2, Scientific Geography Series. Beverly Hills, CA: Sage Publications, 1984.

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Hua, Chang-i, and Frank Porell. "A Critical Review of the Development of the Gravity Model," International Regional Science Review 4 (1979) 97-126.

This paper provides a helpful overview of the members of the gravity model family, including trip distribution models, and the structural properties of gravity models. Gravity models differ with respect to whether total outflows from each place and total inflows into each place are endogenous, and whether individual interplace flows add up to total outflow and total inflow of each place.

Isserman, Andrew. "Estimating Export Activity in a Regional Economy: A Theoretical and Empirical Analysis of Alternative Methods," International Regional Science Review, 5 (Winter 1980) 155-184.

Several methods of estimating regional exports are investigated. These methods are often used with national input-output models to convert them to regional models. The author found that the widely used location quotient method underestimates exports in general. He suggests that additional data on commodity flows such as Census of Transportation data be used in future work.

Isserman, Andrew. "The Location Quotient Approach to Estimating Regional Economic Impacts," Journal of the American Institute of Planners 43 (Jan. 1977) 33-41.

Knetsch, Jack and J.A. Sinden. "Willingness to Pay and Compensation Demanded: Experimental Evidence of an Unexpected Disparity in Measures of Value," Quarterly Journal of Economics, August 1984, 507-521.

Willingness to pay for and willingness to accept compensation for foregoing a good or service are theoretically about equal but have been observed to be quite different in many recreation studies. This paper confirms the finding of large differences between willingness to pay and willingness to sell under controlled experimental conditions. Thus the economic valuation of a recreation resource (using consumer surplus) depends critically upon the assumed property rights, namely whether the recreationist has the right to use the resource or must purchase the right to use the resource.

Knetsch, Jack L., Richard E. Brown, and William J. Hansen. "Estimating Expected Use and Value of Recreation Sites." Planning for Tourism Development: Quantitative Approaches, ed. C. Gearing, W. Swart, and T. Var. New York: Praeger Publishers, 1976.

Leonardi, G. "A General Accessibility and Congestion-Sensitive Multiactivity Spatial Interaction Model," Papers of the Regional Science Association 47 (1981) 3-18.

The author provides a generalization of the doubly-constrained trip distribution model. Of interest in this study are the relationships among the production constrained representation and the attraction constrained representation. The general form of the doubly constrained model is:

$$T_{ij} = u_i v_j f_{ij}$$

$$\sum_j T_{ij} = G_i$$

$$\sum_i T_{ij} = A_j$$

where T_{ij} is the number of trips from origin i to destination j, G_i is the total number of trips generated from i, A_j is the total number of trips attracted to j, f_{ij} is a measure of impedance to travel from i to j, expressed as a function of travel cost C_{ij}, and u_i and v_j are balancing factors of biproportionality.

To put the doubly constrained model into operational form, one can represent spatial interaction in a production-constrained form or an attraction-constrained form. For example, the production-constrained form is obtained by dividing both sides of the equation $T_{ij} = u_i v_j f_{ij}$ by G_i to obtain:

$$T_{ij} = \frac{G_i v_j f_{ij}}{\sum_j v_j f_{ij}}$$

Management Consulting Corporation. Inventory of California Boating Facilities, November 1977, prepared for the California Department of Navigation and Ocean Development. Sacramento, CA: Management Consulting Corporation, 1977.

This report provides a comprehensive inventory of moorings, berths, dry storage facilities, launch lands and hoists in California in 1982. The data list the characteristics of individual facilities and is also grouped by county.

McConnell, Kenneth. "Values of Marine Recreational Fishing: Measurement and Impact of Measurement," American Journal of Agricultural Economics 61 (November 1979) 921-925.

McConnell, Kenneth, and Ivar Strand. "Measuring the Cost of Time in Recreation Demand Analysis: An Application to Sportfishing," American Journal of Agricultural Economics 63 (Feb. 1981) 153-157.

McConnell, Kenneth, and Virgil E. Norton. "An Economic Evaluation of Marine Recreation Fishing." Marine Recreational Fisheries, ed. R. Stroud. Washington D.C.: Sport Fishing Institute, 1976.

McDonald, Kim. "Scientists Assail Oil Drilling Near Santa Barbara Campus," Chronicle of Higher Education, October 17, 1984, pp. 1, 12.

This article reports that the proposal to build two drilling and production platforms in the Santa Barbara Channel near the campus of the University of California at Santa Barbara has brought out some criticism. Some scientists at the university fear that drilling may contaminate the sea water and affect biological research. A major spill would destroy their research projects. Environmental effects (such as air pollution) and visual impacts were also cited as adverse impacts of the proposed facility. However, not all faculty oppose the project, recognizing that it has economic benefits for the region.

Mead, Walter and Philip Sorensen. "The Economic Cost of the Santa Barbara Oil Spill," Santa Barbara Oil Symposium, December 16, 17, 18, 1970, University of California, Santa Barbara.

Meade, Norman, and Robert Anderson. "Problems and Perspectives in Measuring the Social Costs of Oil Pollution," American Petroleum Institute, Proceedings, 1979 Oil Spill Conference.

Mendelsohn, Robert and Gardner Brown. "Revealed Preference Approaches to Valuing Outdoor Recreation," Natural Resources Journal 23 (July 1983) 607-618.

The travel cost method is reviewed for applicability to various situations in which recreation resources are to be valued. The travel cost method is to be used to value the recreation site itself, and the authors argue that the levels of expenditures on nontravel inputs should be excluded from the model. On-site time should also be excluded from travel cost. If one wishes to analyze the value of changing a characteristic of a site, the authors recommend including site characteristics of alternative sites in the model as well as prices (travel costs).

Menz, Frederic, and Donald Wilton. "Alternative Ways to Measure Recreation Values by the Travel Cost Method," American Journal of Agricultural Economics 65 (May 1983) 332-339.

The travel cost method can be implemented in several ways with regard to estimating the area under the demand curve for a recreation site. The authors of this paper compare three methods: Method Ia fits a curve through the aggregate of the origin demand curves determined from the travel cost method and takes the integral to estimate the area under the curve. Method Ib fits the same curve through the aggregate of the origin demand curves from the travel cost method but approximates the area under the demand curve using one dollar increments in entrance fees. Method II integrates under the demand curves determined from the travel cost method for each individual origin-site combination and then sums these areas to obtain consumer surplus. The three methods yield different results. The authors do not indicate a preference for any one method but suggest that Method II may be the most accurate. Data for fishing in New York State are used to illustrate the methods.

Moncur, James. "Estimating the Value of Alternative Outdoor Recreation Facilities within a Small Area," Journal of Leisure Research 7 (1975) 301-311.

The author estimated visits per 10,000 population to each of eleven Hawaii recreation areas as a function of the travel costs to all recreation areas in the study. Thus he was able to estimate demand functions for recreation including the price of the recreation site in question and the prices of substitute and complementary sites. A travel cost measure of prices was used. In many cases alternative recreation sites were found to be substitutes, but some were unexpectedly found to be complements. Consumer surplus and demand schedules for individual sites were estimated.

National Coalition for Marine Conservation. An Economic Assessment of Marine Recreational Fishing in Southern California, prepared by Jones and Stokes Associates, Inc., submitted to National Marine Fisheries Service. Sacramento, CA: Jones and Stokes Associates, May, 1985.

National Oceanic and Atmospheric Administration. Assessing the Social Costs of Oil Spills: The Amoco Cadiz Case Study, July 1983.

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National Oceanic & Atmospheric Administration. National Marine Fisheries Service. Valuing Marine Recreation Fishing on the Pacific Coast, prepared by Energy and Resource Consultants, Inc., Boulder, CO, and Dr. Daniel Huppert, project manager, La Jolla, CA. NOAA Contract No. NA83ABC00205. Washington D.C.: March, 1985.

National Oceanic & Atmospheric Administration. National Ocean Survey. Navigational charts: 18600, 18620, 18640, 18645, 18649, 18680, 18700, 18721, 18725, 18740, 18744, 18746, 18774.

Ravenstein, E.G. "The Laws of Migration," Journal of the Royal Statistical Society, 48 (1885) 167-235.

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Rogers, Golden and Halpern. Summary Report of the Impacts of Coastal Energy Development on New Jersey's Shorefront Recreational Resources, report to the New Jersey Department of Environmental Protection, Division of Coastal Resources, 1984.

Round, Jeffery, "Nonsurvey Techniques: A Critical Review of the Theory and the Evidence," International Regional Science Review 8 (December 1983) 189-212.

Nonsurvey input output techniques are widely used to estimate regional multipliers. Nonsurvey methods represent the only realistic alternative to estimating regional multipliers in many cases but some simple methods like location quotients are generally inaccurate in estimating the trade flows needed to regionalize national tables. The author concludes that the performance of nonsurvey methods is quite difficult to evaluate.

Rowe, Robert D., Edward R. Morey, Arthur D. Ross and W. Douglass Shaw. "Valuing Marine Recreation Fishing on the Pacific Coast," prepared by Energy and Resource Consultants, Inc. for Dr. Daniel Huppert, National Marine Fisheries Service, National Oceanic and Atmospheric Administration. La Jolla, California, March 1985.

Rowe, Robert D., and Lauraine Chestnut. The Value of Visibility. Cambridge: Abt Books, 1982.

This book is concerned with the economic valuation of clean air insofar as pollution reduces visibility. It makes two important contributions to research on the impacts of offshore oil and gas development: 1) it reviews the different kinds of consumer surplus in detail; and 2) it reviews the strengths and weaknesses of bidding and hedonic methods of estimating consumer surplus for amenities.

Rowe, Robert D. and Lauraine Chestnut. "Valuing Environmental Commodities: Revisited," Land Economics, 59 (1983) 404-410.

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San Diego Convention and Visitors Bureau (SDCVB). Visitor Profile: Highlights on Visitors to San Diego, Annual Report — 1982, prepared by C.I.C. Research Inc. (formerly Copley International Corporation). San Diego: SDCVB, 1983a.

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Santa Monica Convention and Visitors Bureau (SMCVB). Tourism is Everybody's Business. Santa Monica: SMCVB, 1984.

Scardino, Vincent, et al. Analysis and Computer Modeling of Summer Outdoor Recreation in the Northeast. Cambridge: Abt Associates, 1979.

The authors conducted a survey of households to determine the factors which affect whether someone participates in a given recreation activity and to determine the factors which affect the frequency of participation in a given recreation activity. The factors were then used to forecast recreation activity. The probability of participating in a given recreation activity was modeled as a function of household characteristics and the availability of recreation sites. Frequency of participation was modeled as a function of household characteristics, distance traveled, availability of recreation sites, and the probability of participation. The authors found that household characteristics are only modestly successful at predicting recreation participation and frequency of participation.

Sen, Ashish, and Siim Soot. "Selected Procedures for Calibrating the Generalized Gravity Model," Papers of the Regional Science Association 48 (1981) 165-176.

This paper is most useful for its summary of the structure of trip distribution models. They discuss the iterative proportional fitting procedure for reconciling outflows and inflows of people or goods when these are not equal.

Smith, V. Kerry, William Desvousges, and Matthew McGivney. "The Opportunity Cost of Travel Time in Recreation Demand Models," Land Economics, 59 (August 1983) 359-277.

Smith, V. Kerry. "The Estimation and Use of Models of Demand for Outdoor Recreation," appendix B. Assessing the Demand for Outdoor Recreation, pp. 91-123. Washington D.C.: National Academy of Sciences, 1975.

Stevens, Benjamin, George Treyz, and David Ehrlich. "On the Estimation of Regional Purchase Coefficients, Export Employment, and Elasticities of Response for Regional Economic Models," Regional Science Research Institute Discussion Paper No. 114, 1979.

Regional purchase coefficients are estimates of the proportion of a good demanded in the region of interest supplied by producers from within the region of interest. These coefficients can be used to regionalize a national input output model. The authors estimate regional purchase coefficients using Census of Transportation data for state to state commodity shipments and then regress these coefficients on characteristics of the regional economy such as relative wages in the region. These regression models can be used to estimate regional purchase coefficients when commodity flow data are not available for the region and commodity of interest. The method is compared with the location quotient method used to regionalize national input output tables and found to be superior.

Stevens, Benjamin, et al. "A New Technique for the Construction of Non-Survey Regional Input-Output Models and Comparisons with Two Survey-Based Models," International Regional Science Review 8 (December 1983) 271-286.

A technique of estimating regional input output models based on national technological coefficients is presented. The technique uses regional purchase coefficients, i.e. the proportion of regional demand met by regional production. These coefficients are estimated using regression analysis: the proportion of regional demand met by regional production is regressed on relative regional wages, relative regional employment, and other variables. Observations are based on Census of Transportation state level data and Census of Manufacturer's data. The authors argue that their technique is advantageous when compared to location quotient methods because of its superior theoretical grounding although data are somewhat imperfect.

Stewart, J.Q. "Empirical Mathematical Rules Concerning the Distribution and Equilibrium of Population," Geographical Review, 37 (1947) 461-85.

Stynes, Daniel, Michael Bevins, and Tommy Brown. "Trends or Methodological Differences?" in Proceedings, 1980 National Outdoor Recreation Trends Symposium, U.S. Forest Service, Northeast Experiment Station General Technical Report NE-57.

Sullivan, J. "Determining Changes in Final Demands for IMPLAN Economic Impact Analysis," in Notes on IMPLAN Manual, Part B, IV.

Sutherland, Ronald. "The Sensitivity of Travel Cost Estimates of Recreation Demand to the Functional Form and Definition of Origin Zones," Western Journal of Agricultural Economics (1982a) 87-98.

The author estimates consumer surplus for camping, fishing, boating, and swimming in the Pacific Northwest. The major contribution of this paper is the methodology used to make the estimates of consumer surplus and to estimate changes in consumer surplus given changes in the quality of the recreation sites. A trip distribution model is used to estimate recreation trips given the number of activity days produced at each origin zone and the number of activity days attracted to each recreation zone. A distance decay function for travel to engage in each activity is estimated. Participation in various recreation activities is estimated on the basis of household characteristics and recreation accessibility, but the goodness of fit is rather poor. Recreation attractions to each recreation zone are estimated as functions of recreation facility characteristics and accessibility of the recreation sites to population.

Sutherland, Ronald. "A Regional Approach to Estimating Recreation Benefits of Improved Water Quality," Journal of Environmental Economics and Management, 9 (1982b) 229-247.

Sutherland, Ronald. "Recreation Benefits and Displaced Facilities," Journal of Leisure Research 14 (1982c) 248-262.

Sutherland, Ronald. "A Regional Recreation Demand and Benefits Model," Los Alamos National Laboratory Report LA - 9699-MS (1983).

This report describes a regional recreation demand and benefits model that is used to estimate recreation demand and consumers' surplus of four activities at each of 195 sites in Washington, Oregon, Idaho and Western Montana. The major components of this research include a trip production model, an attractions model, a gravity model and a travel-cost recreation demand curve model. The author applies the methodology to estimating existing benefits from recreation sites, and to predicting benefits from improved water quality at currently degraded sites.

Texas Parks and Wildlife Department. Attendance at Galveston Island State Park.

Tobin, James. "Estimation of Relationships for Limited Dependent Variables," Econometrica, (1958) pp. 24-26.

U.S. Bureau of the Census. County and City Data Book, 1983. Washington D.C.: U.S. Government Printing Office, 1983

U.S. Fish and Wildlife Service. 1980 National Survey of Fishing, Hunting, and Wildlife Associated Recreation.

This survey reports participation in and expenditures on hunting, fishing, and wildlife associated recreation. About 36,000 fishermen, anglers, and non-consumptive users were interviewed after 116,000 households were screened to determine if anyone in the household participated in the activities of interest. One of the more useful tables in the report is expenditures for saltwater fishing (Table 19). Participation in various activities is also presented by state. State reports with more state level detail are available from each state.

U.S. General Services Administration. Investigation of Operating Costs for Privately Owned Vehicles. Washington D.C.: U.S. General Printing Office, 1980.

U.S. Geological Survey. Pacific OCS Region, with City of Oxnard. Environmental Impact Report, Environmental Assessment, Union Oil Company, Platform Gina and Platform Gilda Project. Los Angeles: MMS, May 1980.

U.S. Minerals Management Service. Exploratory Wells Drilled in the Pacific Outer Continental Shelf, September 20, 1963 to December 31, 1984. December, 1984.

U.S. Minerals Management Service. Pacific OCS Region. "Pacific OCS Region Platforms Installed and Proposed, Pipelines and Cables Data for Pacific OCS Region," 2 tables, May 1985.

U.S. Water Resources Council. Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. Washington D.C.: 1983.

Section VIII of these economic and environmental principles and guidelines covers benefit evaluation procedures for recreation. The report recommends the use of the travel cost method or the contingent valuation method for estimating the economic benefits of recreation. The unit day value method may also be used if a more reliable travel cost method or contingent valuation method cannot be used or is not feasible.

The report explains how to use each of the three methods. In addition, the steps in evaluating the economic benefits of a project are laid out: define the study area, estimate the recreation resource, forecast recreation use, determine without-project condition, forecast recreation use diminished by the project, forecast recreation use with the project, estimate the value of recreation diminished by the project, and estimate the value of recreation use with the project.

Vars, R. Charles. Recreational Boating in Western Oregon, Oregon State University Sea Grant College Program Publication No. ORESU-T-79-005.

Vaughan, William J. and Clifford S. Russell, "Valuing a Fishing Day: An Application of a Systematic Varying Parameter Model," Land Economics 58 (November 1982) 450-463.

Willekens, Frans. "Log-Linear Modelling of Spatial Interaction," Papers of the Regional Science Association 52 (1983) 187-205.

The author reviews the relationships among several types of trip distribution models -- traditional gravity models, biproportional adjustment models, entropy models, and log-linear spatial interaction models. This paper is useful in understanding the operational nature of trip distribution models.

Wilman, Elizabeth. External Costs of Coastal Beach Pollution. Washington: Resources for the Future, 1984.

Ziemer, Rod, Wesley Musser, and R.C. Hill. "Recreation Demand Equations: Functional Form and Consumer Surplus," American Journal of Agricultural Economics, 62 (Feb. 1980) 136-141.

The functional form of the travel cost method is compared using linear, quadratic, and semi log approaches. Independent variables are average cost, average distance traveled, education, and income. Observations are for warm water fishing in Georgia. Consumer surplus derived from each of the three methods was calculated and found to be much higher using the linear model. The authors recommend that analyses carefully consider functional form in using the travel cost method.

Zipf, G.K. Human Behavior and the Principle of Least Effort. New York: Hafner, 1949.

APPENDIX B: COMMUNITY PROFILES

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APPENDIX B: COMMUNITY PROFILES

A. Socioeconomic Profiles

The data tables in this section list the socioeconomic characteristics of each coastal county and most coastal cities. The county characteristics contained in Table 3B-1 include total population, percent black, percent Hispanic, percent male, median household income, median age, the population over age 25 with more than four years of high school, and that with more than four years of college education. The same characteristics are listed for coastal cities in Table 3B-2. Tables 3B-3 and 3B-4 depict some key housing indicators for coastal counties and cities, respectively. The housing data includes housing units, change in housing units between 1970 and 1980, median income, median housing values and median rent. Data in tables 3B-1 to 3B-4 are from the U.S. Census Bureau.

B. Economic Data By Sector

The data in Tables 3B-5 to 3B-19 list employment and earnings for each of the fifteen coastal California counties from 1979 through 1982. The data is broken down by major industrial sector. These are the same nine industrial sectors for which changes in employment and income are estimated in the economic effects model. The data was compiled from information provided by the U.S. Bureau of Economic Analysis, Regional Economic Information System (REIS). The REIS publishes similar information each year.

C. Government Tax Revenues

Three major sources of revenues are associated with visitor spending: sales and use taxes, park and recreation fees, and transient lodging taxes. The 1982-83 fiscal year revenues from these taxes to each coastal county in California and each major coastal city in those counties are listed in Tables 3B-20 and 3B-21. Also listed in the tables are the total revenues from all sources to those jurisdictions in that fiscal year.

There are wide variations in the percentage of total revenues that these tax revenues represent. The City of Carmel in Monterey County is noteworthy, with more than 20 percent of its total revenues attributable to transient lodging taxes. By contrast, the comparable figure for the City of Los Angeles is less than 1 percent.

Sales taxes, park and recreation fees, and transient lodging taxes typically do not represent a major source of revenue to county governments, which obtain much of their revenue by way of property taxes. Coastal cities, however, do earn a great deal of revenue from this source. Sales taxes in particular account for as much as 46 percent of total revenues in the City of Capitola in Santa Cruz County.

D. Tourism Spending and Employment

No consistent source of information was hitherto available on the relative importance of tourist spending to the economies of coastal California counties. In an effort to estimate that importance, we inserted baseline rates of coastal recreational participation in 1982 into the economic effects model used in this study (described in Section III of this volume). We then compared the model results to total 1982 employment. The results are reported in Table 3B-22.

As indicated by the revenue table in the previous section, there is a wide variation between counties in the importance of coastal recreation to their economies. The figures for visitor expenditures in the table of this section include all participants from outside the given county. The employment and income figures include direct as well as indirect and induced effects -- that is, the result of multiplier effects on all sectors of the economy resulting from the initial spending by visitors. These overall effects might account for as much as 16 to 22 percent of all employment in some of the counties, and as much as 40 to 70 percent of employment in the services sectors of the economy. The economy of Los Angeles County is proportionally least affected by coastal recreation visitors, and Mendocino County is most affected.

Furthermore, the spending (outside counties of origin) of coastal recreators might account overall for more than 4 percent of all the service sector employment in the state of California, and that spending is estimated to result in over 1.5 percent of all employment in the state.

E. Beach Characteristics and Attendance

The state, county, city, and federally maintained beaches included in this study are listed in Table 3B-23. The beaches are listed by county and geopiece and are numbered to correspond to their north to south position.

Table 3B-23 also provides attendance figures and length of beach frontage, which are not readily available in a single alternative source. The beach length was obtained from the California State Department of Parks and Recreation for the state maintained beaches, and from the relevant jurisdictions for the other beaches. If data was not available elsewhere, a beach's oceanfront footage was estimated from maps or charts. Attendance data was also collected from the relevant jurisdictions, and is reported for the fiscal year 1979/80. Blank entries indicate that attendance data is not available for the beach.

This table also lists the calculated value of the oil variable used in the model. This value is the sum of the inverses of the distance from the beach to each platform within 20 miles of the beach.

Information on beach facilities and landscape characteristics is readily available in the California Coastal Commission's California Coastal Access Guide and is therefore not duplicated here.

F. Boating Facilities and Registration

Table 3B-24 provides information at the county level on the number of boat moorings, berths, dry storage, launch lanes, and hoists. These figures were compiled from information reported by the Department of Navigation and Ocean Development in their Inventory of Boating Facilities. The reported figures reflect the number of facilities available in marinas with ocean access.

County boat registration data that includes pleasure and rental boats is also reported in Table 3B-24. Boat registration data was obtained from the California Department of Motor Vehicles.

G. Fishing Sites and Licenses

Table 3B-25 indicates locations by county and geopiece where piers, jetties, and wharfs are available for ocean fishing. To reflect the potential of boat fishing the table also includes information on the boat facility capacity of harbors and bays. This data was compiled from the Inventory of California Boating Facilities and the previously cited California Coastal Access Guide.

Resident sport fishing license sales by county are listed in Table 3B-26. The numbers were compiled using data supplied by the California Department of Fish and Game. The Department reports total sales by type of license sold, but not at the county level. The Department did provide an average ratio of sport fishing license sales by county which was used to estimate county sales. These ratios originate from an undocumented source in the Department.

H. Important Tourist Attractions

This section contains brief descriptions of the prominent recreational and cultural tourist attractions along the California coast. The material is grouped at the county level and arranged from north to south. The coastal cities are incorporated within their respective counties. Each city first lists coastal attractions, arranged from north to south, and then lists other attractions, arranged alphabetically. The California Coastal Access Guide and the American Automobile Association's Tour Guide were the primary sources of information for this section.

TABLE 3B-1

POPULATION PROFILES FOR COASTAL CALIFORNIA COUNTIES
1980

COUNTY	TOTAL POPULATION	PERCENT BLACKS	PERCENT HISPANIC	MEDIAN HOUSEHOLD INCOME	MEDIAN AGE	PERCENT MALE	POPULATION 25 YEARS OLD OR OLDER WITH: 4+ YRS HIGH SCHOOL	4+ YRS COLLEGE
CALIFORNIA TOTAL	23,667,902	7.68%	19.19%	$18,243	29.9	49.3%	10,319,250	2,752,865
DEL NORTE	18,217	0.19%	6.21%	$13,793	30.8	50.4%	7,305	1,297
HUMBOLDT	108,514	0.71%	3.61%	$14,774	29.1	50.0%	48,910	11,537
MENDOCINO	66,738	0.56%	5.49%	$15,013	31.5	49.7%	31,537	7,305
SONOMA	299,681	1.16%	6.93%	$17,732	31.9	47.0%	145,819	38,235
MARIN	222,568	2.53%	4.17%	$24,554	33.8	49.1%	134,530	57,391
SAN FRANCISCO	678,974	12.69%	12.40%	$15,866	33.9	49.7%	354,548	135,293
SAN MATEO	587,329	6.06%	12.41%	$23,172	32.9	49.7%	309,237	96,491
SANTA CRUZ	188,141	0.82%	14.63%	$16,877	30.6	48.9%	90,563	27,419
MONTEREY	290,444	6.57%	25.71%	$17,658	27.8	51.2%	114,544	31,640
SAN LUIS OBISPO	155,435	1.80%	9.49%	$14,805	30.2	50.9%	71,072	17,561
SANTA BARBARA	298,694	2.73%	19.50%	$17,362	29.7	49.2%	139,529	43,439
VENTURA	529,174	2.15%	21.39%	$21,236	28.6	49.7%	225,795	53,950
LOS ANGELES	7,477,503	12.61%	27.62%	$17,551	29.8	48.8%	3,394,462	918,658
ORANGE	1,932,709	1.27%	14.78%	$22,557	29.5	49.3%	908,925	255,992
SAN DIEGO	1,861,846	5.61%	14.75%	$17,106	29.7	50.8%	837,129	223,945

SOURCE: U.S. CENSUS BUREAU, 1983.

TABLE 3B-2

POPULATION PROFILES FOR COASTAL CALIFORNIA CITIES 1980

CITY	TOTAL POPULATION	PERCENT BLACKS	PERCENT HISPANIC	MEDIAN HOUSEHOLD INCOME	MEDIAN AGE	POPULATION 25 YEARS OLD OR OLDER WITH: 4+ YRS HIGH SCHOOL	4+ YRS COLLEGE
CRESCENT CITY	3,075	0.00%	4.16%	$11,635	NA	NA	NA
EUREKA	24,153	1.90%	4.17%	$13,679	NA	NA	NA
FORT BRAGG	5,019	0.00%	6.38%	$14,336	NA	NA	NA
SAN FRANCISCO	678,974	12.69%	12.40%	$15,866	34.1	354,548	135,263
HALF MOON BAY	7,282	1.55%	10.64%	$25,467	NA	NA	NA
SANTA CRUZ	41,483	2.01%	8.69%	$14,026	29.2	19,960	6,204
CAPITOLA	9,095	1.08%	6.39%	$14,025	NA	NA	NA
MONTEREY	27,558	2.76%	5.94%	$17,554	29.9	14,436	5,588
CARMEL	4,707	0.47%	1.57%	$18,607	NA	NA	NA
SANTA BARBARA	74,414	2.46%	22.15%	$15,445	33.5	39,579	14,195
CARPINTERIA	10,835	0.55%	30.73%	$17,464	NA	NA	NA
VENTURA	74,393	1.17%	12.12%	$18,791	31.7	37,388	9,430
LOS ANGELES	2,966,850	17.00%	27.48%	$15,735	30.3	1,237,317	357,554
SANTA MONICA	88,314	4.04%	12.99%	$16,604	34.3	52,558	21,545
MANHATTAN BEACH	31,542	0.29%	4.32%	$29,404	32.4	19,795	8,881
LONG BEACH	361,334	11.20%	13.96%	$15,394	31.1	164,947	40,835
REDONDO BEACH	57,102	1.37%	11.47%	$21,829	29.8	30,407	8,764
HUNTINGTON BEACH	170,505	0.57%	7.88%	$24,015	28.8	84,767	24,796
NEWPORT BEACH	62,556	0.19%	2.60%	$27,516	36.5	40,417	18,225
LAGUNA BEACH	17,901	0.20%	4.50%	$21,165	NA	NA	NA
SAN CLEMENTE	27,325	1.16%	8.37%	$19,159	33.8	15,434	4,471
OCEANSIDE	76,698	7.72%	18.28%	$14,969	28.6	32,563	6,197
DEL MAR	5,017	0.46%	3.77%	$22,500	NA	NA	NA
SAN DIEGO	875,538	8.85%	14.84%	$16,408	28.4	397,015	120,651

SOURCE: U.S. CENSUS BUREAU, 1983.

TABLE 3B-3

HOUSING DATA FOR COASTAL CALIFORNIA COUNTIES
1980

COUNTY	HOUSING UNITS	1970-1980 CHANGE IN HSG UNITS	PERCENT VACANCY	PERCENT OWNER-OCCUPIED	MEDIAN VALUE	MEDIAN RENT	PERSONS PER HOUSEHOLD	EMPLOYMENT/ EMPLOYED RESIDENT
CALIFORNIA TOTAL	9,279,036	32.55%	6.40%	52.33%	$84,700	$283	2.68	1.00
DEL NORTE	7,581	41.94%	7.53%	61.91%	$49,900	$219	2.64	1.02
HUMBOLDT	45,381	28.84%	6.77%	56.40%	$57,000	$234	2.55	1.02
MENDOCINO	28,998	53.32%	11.15%	57.04%	$69,800	$25[illegible]	2.61	1.00
SONOMA	124,189	59.09%	7.47%	58.79%	$88,400	$299	2.56	0.97
MARIN	92,649	28.68%	3.93%	57.60%	$151,000	$37[illegible]	2.47	[illegible]
SAN FRANCISCO	316,608	2.00%	5.50%	31.86%	$104,600	$255	2.19	1.56
SAN MATEO	233,200	22.05%	3.31%	57.68%	$124,400	[illegible]	2.58	0.85
SANTA CRUZ	80,863	55.49%	9.70%	53.69%	$94,100	$303	2.54	0.95
MONTEREY	103,557	36.63%	7.27%	49.20%	$86,500	$299	2.85	[illegible]
SAN LUIS OBISPO	66,780	77.55%	11.91%	51.98%	$77,600	$279	2.51	0.94
SANTA BARBARA	114,910	29.39%	4.71%	50.44%	$104,000	$309	2.62	1.02
VENTURA	193,394	62.69%	5.49%	61.83%	$93,300	$317	3.03	0.79
LOS ANGELES	2,855,578	12.35%	4.31%	46.38%	$86,000	$277	2.69	1.06
ORANGE	721,514	55.77%	4.67%	57.66%	$108,100	$358	2.79	0.93
SAN DIEGO	720,346	59.79%	6.66%	51.43%	$91,000	$281	2.62	0.95

SOURCE: U.S. CENSUS BUREAU, 1983.

TABLE 3B-4

HOUSING DATA FOR COASTAL CALIFORNIA CITIES
1980

AREA	HOUSING UNITS	1970-1980 CHANGE IN HSG UNITS	PERCENT VACANCY	PERCENT OWNER-OCCUPIED	MEDIAN VALUE	MEDIAN RENT	PERSONS PER HOUSEHOLD	EMPLOYMENT PER RESIDENT
CALIFORNIA TOTAL	9,279,036	32.55%	6.40%	52.33%	$84,700	$283	2.68	1.00
CRESCENT CITY	1,300	NA	6.62%	43.57%	$47,100	222	NA	NA
EUREKA	10,727	NA	5.65%	53.94%	$54,900	$228	NA	NA
FORT BRAGG	2,249	NA	7.65%	55.90%	$64,000	249	NA	NA
SAN FRANCISCO	316,608	2.00%	5.50%	31.86%	$104,600	$285	2.19	1.56
HALF MOON BAY	2,726	NA	4.29%	72.63%	$123,500	$367	NA	NA
SANTA CRUZ	17,871	30.63%	6.48%	44.81%	$90,300	$290	2.30	1.50
CAPITOLA	4,879	NA	11.19%	43.06%	$89,500	$336	NA	NA
MONTEREY	12,096	28.35%	7.21%	33.94%	$103,800	$332	2.27	1.61
CARMEL	3,124	NA	18.05%	53.24%	$155,900	$393	NA	NA
SANTA BARBARA	33,925	14.73%	4.10%	39.92%	$130,800	$317	2.22	1.23
CARPINTERIA	4,405	NA	9.44%	52.59%	$116,800	$341	NA	NA
VENTURA	30,627	51.79%	4.64%	54.84%	$93,400	$306	2.52	0.99
LOS ANGELES	1,189,475	10.73%	4.52%	38.47%	$96,100	$262	2.55	1.16
SANTA MONICA	46,418	10.24%	5.33%	20.95%	$189,800	$319	1.97	1.26
MANHATTAN BEACH	13,704	4.40%	4.23%	58.72%	$159,700	$462	2.41	0.44
REDONDO BEACH	25,867	27.73%	4.67%	36.55%	$113,500	$412	2.31	0.84
HUNTINGTON BEACH	63,686	77.05%	3.87%	55.33%	$120,400	$398	2.78	0.56
LONG BEACH	159,715	6.38%	4.96%	40.76%	$82,100	$263	2.31	1.00
NEWPORT BEACH	31,397	39.41%	10.08%	48.12%	$200,100	$462	2.23	1.58
LAGUNA BEACH	9,478	NA	9.74%	53.00%	$200,100	$382	NA	NA
SAN CLEMENTE	13,233	76.94%	10.33%	46.13%	$136,800	$354	2.32	0.61
OCEANSIDE	32,733	124.29%	11.00%	49.27%	$75,300	$287	2.58	0.62
DEL MAR	2,482	NA	9.23%	46.03%	$200,100	$392	NA	NA
SAN DIEGO	341,928	41.66%	5.99%	46.14%	$90,700	$274	2.53	0.93

SOURCE: U.S. CENSUS BUREAU, 1983

Table 3B-5

Employment(1) and Earnings(2) by Major Industrial Sector, 1979-1982
Del Norte County, California

Sector	1979	1980	1981	1982
Agriculture, Forestry, Fisheries and Other (3)				
Employment	466	447	430	437
Earnings	9.9	10.5	10.1	10.6
Mining				
Employment	NA	NA	NA	NA
Earnings	NA	NA	NA	NA
Construction				
Employment	112	NA	NA	125
Earnings	1.8	NA	NA	1.5
Manufacturing				
Employment	1,991	1,803	1,404	934
Earnings	37.8	37.8	33.6	21.3
Communication and Utilities				
Employment	266	277	297	257
Earnings	5.0	6.1	5.5	5.4
Trade				
Employment	1,251	1,053	1,002	931
Earnings	11.6	11.7	12.0	12.0
Finance, Insurance, and Real Estate				
Employment	177	180	179	129
Earnings	2.9	3.1	3.1	2.4
Services				
Employment	790	780	794	819
Earnings	10.4	10.7	11.1	11.6
Government Enterprises				
Employment	1,619	1,622	1,582	1,519
Earnings	19.0	21.3	22.3	22.6

Source: U.S. Bureau of Economic Analysis, Regional Economic Information System, 1984

Notes: (1) Total Wage and Salary Employment (excludes proprietors)
(2) Millions of Dollars
(3) Includes residents working for international organizations in the U.S.
NA Data not available, due to disclosure of confidential information,

Table 3B-6
Employment(1) and Earnings(2) by Major Industrial Sector, 1979-1982
Humboldt County, California

Sector	1979	1980	1981	1982
Agriculture, Forestry, Fisheries and Other (3)				
Employment	900	NA	NA	NA
Earnings	24.2	NA	NA	NA
Mining				
Employment	37	NA	NA	NA
Earnings	0.2	NA	NA	NA
Construction				
Employment	1,344	1,182	1,037	879
Earnings	32.1	30.2	25.1	23.0
Manufacturing				
Employment	7,976	6,832	6,432	5,591
Earnings	160.8	152.0	148.8	130.9
Communication and Utilities				
Employment	2,473	2,431	2,379	2,227
Earnings	48.6	53.1	55.7	57.1
Trade				
Employment	8,925	8,975	8,897	8,519
Earnings	106.9	114.3	114.9	113.1
Finance, Insurance, and Real Estate				
Employment	1,354	1,413	1,491	1,438
Earnings	19.3	20.3	21.9	23.1
Services				
Employment	9,298	9,610	9,638	9,981
Earnings	102.9	113.7	119.8	133.4
Government Enterprises				
Employment	9,373	9,558	9,796	9,275
Earnings	130.8	149.3	150.0	155.1

Source: U.S. Bureau of Economic Analysis, Regional Economic Information System, 1984

Notes: (1) Total Wage and Salary Employment (excludes proprietors)
(2) Millions of Dollars
(3) Includes residents working for international organizations in the U.S.
NA Data not available, due to disclosure of confidential information,

Table 3B-7
Employment(1) and Earnings(2) by Major Industrial Sector, 1979-1982
Mendocino County, California

Sector	1979	1980	1981	1982
Agriculture, Forestry, Fisheries & Other (3)				
Employment	1,161	1,157	1,155	NA
Earnings	28.8	33.5	32.8	NA
Mining				
Employment	NA	NA	NA	NA
Earnings	NA	NA	NA	NA
Construction				
Employment	1,025	732	627	589
Earnings	17.9	14.4	12.7	12.9
Manufacturing				
Employment	5,388	5,327	5,081	4,715
Earnings	115.5	109.0	105.0	100.8
Communication and Utilities				
Employment	1,138	1,104	1,122	1,012
Earnings	24.4	26.0	28.6	28.9
Trade				
Employment	5,095	5,260	5,081	4,883
Earnings	57.1	58.7	61.1	63.7
Finance, Insurance, and Real Estate				
Employment	821	791	810	829
Earnings	11.6	11.9	12.6	13.4
Services				
Employment	4,547	4,555	4,888	5,056
Earnings	49.4	54.2	58.3	56.0
Government Enterprises				
Employment	5,092	5,280	5,355	5,109
Earnings	60.0	67.5	72.6	78.1

Source: U.S. Bureau of Economic Analysis, Regional Economic Information System, 1984

Notes: (1) Total Wage and Salary Employment (excludes proprietors)
(2) Millions of Dollars
(3) Includes residents working for international organizations in the U.S.
NA Data not available, due to disclosure of confidential information.

Table 3B-8
Employment(1) and Earnings(2) by Major Industrial Sector, 1979-1982
Sonoma County, California

Sector	1979	1980	1981	1982
Agric., Forestry, Fisheries & Other (3)				
Employment	4,172	3,954	4,067	4,101
Earnings	58.4	73.9	76.0	67.9
Mining				
Employment	441	449	468	553
Earnings	11.7	12.8	14.7	18.6
Construction				
Employment	6,414	5,786	5,452	4,721
Earnings	145.0	139.1	140.0	125.2
Manufacturing				
Employment	14,545	15,086	16,200	15,919
Earnings	239.6	272.1	316.4	339.6
Communication and Utilities				
Employment	4,409	4,586	4,941	4,659
Earnings	87.8	102.6	121.1	127.0
Trade				
Employment	21,587	22,664	23,676	23,864
Earnings	256.1	280.4	308.7	327.5
Finance, Insurance, and Real Estate				
Employment	5,212	5,327	5,540	5,534
Earnings	86.5	90.5	98.7	106.9
Services				
Employment	18,976	20,403	21,744	21,952
Earnings	251.9	284.1	314.0	348.2
Government Enterprises				
Employment	20,447	21,283	21,270	21,108
Earnings	276.3	308.1	327.5	355.6

Source: U.S. Bureau of Economic Analysis, Regional Economic Information System, 1984

Notes: (1) Total Wage and Salary Employment (excludes proprietors)
(2) Millions of Dollars
(3) Includes residents working for international organizations in the U.S.
NA Data not available, due to disclosure of confidential information,

Table 3B-9

Employment(1) and Earnings(2) by Major Industrial Sector, 1979-1982

Marin County, California

Sector	1979	1980	1981	1982
Agriculture, Forestry, Fisheries & Other (3)				
Employment	NA	NA	NA	NA
Earnings	NA	NA	NA	NA
Mining				
Employment	NA	NA	NA	NA
Earnings	NA	NA	NA	NA
Construction				
Employment	4,086	3,761	3,635	3,407
Earnings	93.4	94.9	95.9	99.9
Manufacturing				
Employment	4,285	4,785	5,157	5,377
Earnings	83.3	85.9	101.4	113.8
Communication and Utilities				
Employment	2,379	2,520	2,828	2,863
Earnings	51.1	58.4	67.7	70.1
Trade				
Employment	19,749	22,811	21,881	22,380
Earnings	263.9	287.8	319.4	329.7
Finance, Insurance, and Real Estate				
Employment	7,240	8,250	8,850	9,558
Earnings	151.1	175.1	195.6	218.8
Services				
Employment	19,043	20,162	20,843	21,518
Earnings	385.0	415.0	445.8	490.4
Government Enterprises				
Employment	13,588	13,543	13,817	14,345
Earnings	187.9	211.2	221.5	250.0

Source: U.S. Bureau of Economic Analysis, Regional Economic Information System, 1984

Notes: (1) Total Wage and Salary Employment (excludes proprietors)
(2) Millions of Dollars
(3) Includes residents working for international organizations in the U.S.
NA Data not available, due to disclosure of confidential information.

Table 3B-10
Employment(1) and Earnings(2) by Major Industrial Sector, 1979-1982
San Francisco County, California

Sector	1979	1980	1981	1982
Agric., Forestry, Fisheries & Other (3)				
Employment	767	799	878	857
Earnings	16.5	18.3	21.0	21.5
Mining				
Employment	1,386	2,050	2,535	2,478
Earnings	55.3	88.3	121.2	143.8
Construction				
Employment	19,731	21,462	23,554	25,224
Earnings	525.2	623.8	746.5	876.7
Manufacturing				
Employment	49,527	50,741	49,276	48,135
Earnings	1,041.1	1,145.4	1,227.5	1,322.1
Communication and Utilities				
Employment	49,881	53,110	54,129	51,233
Earnings	1,242.7	1,433.7	1,602.8	1,669.4
Trade				
Employment	106,460	109,830	109,613	105,421
Earnings	1,709.7	1,869.1	1,985.0	2,041.0
Finance, Insurance, and Real Estate				
Employment	85,184	88,102	89,565	91,096
Earnings	1,629.5	1,804.1	2,021.3	2,271.3
Services				
Employment	155,927	164,809	173,885	169,777
Earnings	2,386.7	2,709.4	3,098.9	3,374.7
Government Enterprises				
Employment	101,455	104,017	100,277	97,494
Earnings	1,634.6	1,901.3	1,984.9	2,093.9

Source: U.S. Bureau of Economic Analysis, Regional Economic Information System, 1984

Notes: (1) Total Wage and Salary Employment (excludes proprietors)
(2) Millions of Dollars
(3) Includes residents working for international organizations in the U.S.
NA Data not available, due to disclosure of confidential information,

Table 3B-11
Employment(1) and Earnings(2) by Major Industrial Sector, 1979-1982
San Mateo County, California

Sector	1979	1980	1981	1982
Agric., Forestry, Fisheries & Other (3)				
Employment	NA	3,193	3,171	3,173
Earnings	NA	72.4	74.6	73.8
Mining				
Employment	NA	75	95	114
Earnings	NA	3.2	4.7	5.5
Construction				
Employment	13,296	13,929	13,439	11,109
Earnings	333.4	370.8	407.2	373.3
Manufacturing				
Employment	35,796	36,994	35,757	34,933
Earnings	739.1	844.2	910.3	950.0
Communication and Utilities				
Employment	31,744	31,883	30,959	29,907
Earnings	894.8	994.8	1,084.8	1,280.9
Trade				
Employment	59,219	59,422	59,779	57,927
Earnings	1,048.8	1,133.6	1,220.9	1,279.2
Finance, Insurance, and Real Estate				
Employment	15,398	16,213	17,740	17,7[illegible]
Earnings	344.6	388.4	365.6	418.3
Services				
Employment	55,313	57,317	60,755	61,084
Earnings	940.8	1,045.4	1,181.8	1,286.4
Government Enterprises				
Employment	33,741	33,108	33,416	32,977
Earnings	500.6	546.2	593.8	642.3

Source: U.S. Bureau of Economic Analysis, Regional Economic Information System, 1984

Notes:
(1) Total Wage and Salary Employment (excludes proprietors)
(2) Millions of Dollars
(3) Includes residents working for international organizations in the U.S.
NA Data not available, due to disclosure of confidential information.

Table 3B-12

Employment(1) and Earnings(2) by Major Industrial Sector, 1979-1982

Santa Cruz County, California

Sector	1979	1980	1981	1982
Agric., Forestry, Fisheries & Other (3)				
Employment	3,755	3,817	3,900	3,872
Earnings	95.2	109.1	114.2	114.3
Mining				
Employment	78	85	80	59
Earnings	2.3	2.7	2.7	2.2
Construction				
Employment	2,620	2,613	2,462	2,014
Earnings	58.4	62.9	62.5	55.4
Manufacturing				
Employment	9,451	9,823	10,282	10,901
Earnings	144.9	169.8	195.7	221.0
Communication and Utilities				
Employment	2,319	2,209	2,166	2,043
Earnings	43.8	47.9	55.1	57.8
Trade				
Employment	15,905	15,935	16,517	16,077
Earnings	166.6	176.4	193.3	203.8
Finance, Insurance, and Real Estate				
Employment	2,699	2,658	2,878	2,671
Earnings	42.7	41.6	44.9	45.5
Services				
Employment	13,260	13,281	14,193	13,548
Earnings	161.7	177.3	197.2	208.6
Government Enterprises				
Employment	12,484	13,199	14,164	13,686
Earnings	142.2	161.8	183.5	197.7

Source: U.S. Bureau of Economic Analysis, Regional Economic Information System, 1984

Notes: (1) Total Wage and Salary Employment (excludes proprietors)
(2) Millions of Dollars
(3) Includes residents working for international organizations in the U.S.
NA Data not available, due to disclosure of confidential information,

Table 3B-13

Employment(1) and Earnings(2) by Major Industrial Sector, 1979-1982

Monterey County, California

Sector	1979	1980	1981	1982
Agriculture, Forestry, Fisheries & Other (3)				
Employment	22,393	21,607	21,539	22,371
Earnings	509.3	601.9	654.9	615.0
Mining				
Employment	727	375	351	351
Earnings	17.6	9.6	10.5	11.3
Construction				
Employment	3,589	3,323	3,351	3,291
Earnings	81.6	79.6	88.3	95.7
Manufacturing				
Employment	10,403	9,346	9,229	9,192
Earnings	175.9	169.9	176.7	191.0
Communication and Utilities				
Employment	4,761	4,822	5,136	4,594
Earnings	91.7	104.0	115.9	119.4
Trade				
Employment	22,974	22,919	24,133	24,325
Earnings	264.5	280.7	307.1	334.5
Finance, Insurance, and Real Estate				
Employment	4,151	4,308	4,303	4,240
Earnings	65.6	69.7	73.5	77.7
Services				
Employment	21,687	22,047	22,660	23,245
Earnings	280.9	309.9	338.6	365.4
Government Enterprises				
Employment	43,670	44,167	45,309	46,535
Earnings	571.0	631.7	661.9	779.4

Source: U.S. Bureau of Economic Analysis, Regional Economic Information System, 1984

Notes:
(1) Total Wage and Salary Employment (excludes proprietors)
(2) Millions of Dollars
(3) Includes residents working for international organizations in the U.S.
NA Data not available, due to disclosure of confidential information.

Table 3B-14
Employment(1) and Earnings(2) by Major Industrial Sector, 1979-1982
San Luis Obispo County, California

Sector	1979	1980	1981	1982
Agric., Forestry, Fisheries & Other (3)				
Employment	3,199	3,171	3,207	3,233
Earnings	64.2	80.5	77.8	77.4
Mining				
Employment	163	231	241	271
Earnings	3.9	5.1	6.3	7.5
Construction				
Employment	4,066	3,179	3,174	2,682
Earnings	91.6	73.2	83.2	71.9
Manufacturing				
Employment	3,549	3,711	3,714	3,342
Earnings	51.6	62.3	66.9	62.9
Communication and Utilities				
Employment	3,076	3,017	3,329	3,202
Earnings	62.7	66.9	83.3	90.5
Trade				
Employment	11,983	12,394	12,919	13,386
Earnings	109.8	116.9	127.0	139.1
Finance, Insurance, and Real Estate				
Employment	1,703	1,893	1,998	2,068
Earnings	29.9	31.4	32.7	35.5
Services				
Employment	9,943	10,398	11,055	11,481
Earnings	119.6	129.6	147.3	162.7
Government Enterprises				
Employment	11,983	12,347	12,120	11,744
Earnings	189.8	215.7	209.1	211.6

Source: U.S. Bureau of Economic Analysis, Regional Economic Information System, 1984

Notes: (1) Total Wage and Salary Employment (excludes proprietors)
(2) Millions of Dollars
(3) Includes residents working for international organizations in the U.S.
NA Data not available, due to disclosure of confidential information.

Table 3B-15
Employment(1) and Earnings(2) by Major Industrial Sector, 1979-1982
Santa Barbara County, California

Sector	1979	1980	1981	1982
Agric., Forestry, Fisheries & Other (3)				
Employment	6,669	6,494	6,645	7,027
Earnings	139.5	170.0	187.8	194.7
Mining				
Employment	1,233	1,547	1,614	1,671
Earnings	31.2	43.6	50.4	53.9
Construction				
Employment	5,330	5,053	5,094	4,882
Earnings	117.2	122.3	130.2	125.7
Manufacturing				
Employment	17,010	16,424	18,041	17,888
Earnings	288.8	315.5	386.9	442.2
Communication and Utilities				
Employment	4,527	5,040	5,328	5,284
Earnings	99.9	103.1	118.0	131.9
Trade				
Employment	32,666	29,287	29,826	30,120
Earnings	325.5	338.9	362.9	390.6
Finance, Insurance, and Real Estate				
Employment	5,571	5,917	6,227	6,194
Earnings	89.9	96.7	104.9	116.6
Services				
Employment	35,094	36,753	37,238	37,887
Earnings	522.4	608.2	635.4	664.3
Government Enterprises				
Employment	29,423	29,335	30,605	30,792
Earnings	380.1	417.8	455.0	486.7

Source: U.S. Bureau of Economic Analysis, Regional Economic Information System, 1984

Notes:
(1) Total Wage and Salary Employment (excludes proprietors)
(2) Millions of Dollars
(3) Includes residents working for international organizations in the U.S.
NA Data not available, due to disclosure of confidential information,

Table 3B-17

Employment(1) and Earnings(2) by Major Industrial Sector, 1979-1982

Los Angeles County, California

Sector	1979	1980	1981	1982
Agric., Forestry, Fisheries, & Other (3)				
Employment	15,489	15,303	15,435	15,486
Earnings	261	289	311	306
Mining				
Employment	12,001	12,977	14,405	14,192
Earnings	337	405	502	542
Construction				
Employment	122,101	123,959	125,452	105,044
Earnings	2,870	3,187	3,535	3,242
Manufacturing				
Employment	930,845	917,995	923,662	866,918
Earnings	17,241	19,144	21,017	21,479
Communication and Utilities				
Employment	202,981	203,039	203,595	201,059
Earnings	4,763	5,197	5,747	6,075
Trade				
Employment	823,609	825,957	831,299	809,980
Earnings	11,446	12,440	13,551	14,068
Finance, Insurance, and Real Estate				
Employment	240,194	248,610	252,662	245,964
Earnings	4,570	4,887	5,225	5,601
Services				
Employment	890,225	906,750	936,322	936,544
Earnings	14,221	16,029	17,807	19,274
Government Enterprises				
Employment	505,782	507,974	510,984	502,324
Earnings	7,850	8,513	9,269	9,857

Source: U.S. Bureau of Economic Analysis, Regional Economic Information System, 1984

Notes:
(1) Total Wage and Salary Employment (excludes proprietors)
(2) Millions of Dollars
(3) Includes residents working for international organizations in the U.S.
NA Data not available, due to disclosure of confidential information,

Table 3B-16
Employment(1) and Earnings(2) by Major Industrial Sector, 1979-1982
Ventura County, California

Sector	1979	1980	1981	1982
Agric., Forestry, Fisheries & Other (3)				
Employment	16,349	16,560	17,150	17,072
Earnings	295.9	334.6	334.6	327.5
Mining				
Employment	2,481	2,653	2,950	3,111
Earnings	63.6	74.4	95.3	114.0
Construction				
Employment	8,847	8,159	7,190	6,539
Earnings	182.5	190.9	190.3	150.3
Manufacturing				
Employment	23,282	24,115	25,082	25,817
Earnings	425.1	474.4	543.6	616.8
Communication and Utilities				
Employment	6,541	6,595	6,933	6,684
Earnings	129.0	141.4	161.4	172.8
Trade				
Employment	34,913	36,319	36,330	39,283
Earnings	378.3	429.6	469.5	503.9
Finance, Insurance, and Real Estate				
Employment	6,497	6,833	7,380	8,116
Earnings	102.2	111.4	125.8	155.6
Services				
Employment	30,094	31,677	32,588	33,965
Earnings	439.1	501.2	561.7	622.5
Government Enterprises				
Employment	44,791	45,945	46,565	46,400
Earnings	647.7	727.9	800.2	865.4

Source: U.S. Bureau of Economic Analysis, Regional Economic Information System, 1984

Notes: (1) Total Wage and Salary Employment (excludes proprietors)
(2) Millions of Dollars
(3) Includes residents working for international organizations in the U.S.
NA Data not available, due to disclosure of confidential information.

Table 3B-18
Employment(1) and Earnings(2) by Major Industrial Sector, 1979-1982
Orange County, California

Sector	1979	1980	1981	1982
Agric., Forestry, Fisheries & Other (3)				
Employment	11,998	12,006	12,817	12,167
Earnings	144.1	169.5	186.6	185.1
Mining				
Employment	1,943	2,161	2,681	2,903
Earnings	70.6	73.3	110.8	111.2
Construction				
Employment	51,402	50,873	50,117	40,455
Earnings	1,132.8	1,238.3	1,354.1	1,223.0
Manufacturing				
Employment	216,534	219,768	225,905	213,388
Earnings	3,894.8	4,432.4	5,094.0	5,318.3
Communication and Utilities				
Employment	26,908	27,944	30,541	30,975
Earnings	541.5	622.4	747.0	830.3
Trade				
Employment	196,008	204,407	220,854	217,929
Earnings	2,330.8	2,642.7	3,020.4	3,206.9
Finance, Insurance, and Real Estate				
Employment	55,916	59,786	64,152	63,913
Earnings	1,041.6	1,166.1	1,287.9	1,357.6
Services				
Employment	168,952	179,045	187,880	196,237
Earnings	2,656.5	3,084.9	3,525.7	3,946.6
Government Enterprises				
Employment	117,876	121,080	125,011	123,685
Earnings	1,588.5	1,782.4	2,017.6	2,152.3

Source: U.S. Bureau of Economic Analysis, Regional Economic Information System, 1984

Notes: (1) Total Wage and Salary Employment (excludes proprietors)
(2) Millions of Dollars
(3) Includes residents working for international organizations in the U.S.
NA Data not available, due to disclosure of confidential information,

Table 3B-19
Employment(1) and Earnings(2) by Major Industrial Sector, 1979-1982
San Diego County, California

Sector	1979	1980	1981 *	1982
Agric., Forestry, Fisheries & Other (3)				
Employment	14,456	14,464	NA	14,382
Earnings	231.4	274.9	NA	255.5
Mining				
Employment	NA	615	NA	390
Earnings	NA	15.4	NA	13.5
Construction				
Employment	NA	38,981	35,494	29,935
Earnings	NA	915.2	985.1	898.4
Manufacturing				
Employment	100,334	108,701	112,256	108,588
Earnings	1,940.0	2,197.2	2,434.3	2,583.7
Communication and Utilities				
Employment	28,408	29,109	28,985	30,201
Earnings	613.8	683.3	785.0	877.1
Trade				
Employment	148,922	149,944	153,475	155,018
Earnings	1,629.0	1,770.6	1,905.0	2,037.6
Finance, Insurance, and Real Estate				
Employment	38,782	40,077	42,717	44,410
Earnings	696.9	720.9	775.2	873.7
Services				
Employment	NA	160,887	168,007	172,811
Earnings	NA	2,379.3	2,672.0	2,943.1
Government Enterprises				
Employment	295,597	288,928	283,781	284,219
Earnings	3,543.9	3,930.1	4,457.2	4,788.5

Source: U.S. Bureau of Economic Analysis, Regional Economic Information System, 1984

Notes:
- (1) Total Wage and Salary Employment (excludes proprietors)
- (2) Millions of Dollars
- (3) Includes residents working for international organizations in the U.S.
- NA Data not available, due to disclosure of confidential information.

TABLE 3B-20

COASTAL COUNTY GOVERNMENT REVENUES RELATED TO TOURISM
1982-1983

COUNTY	SALES & USE TAXES	PARK AND RECREATION FEES	TRANSIENT LODGING TAXES	TOTAL COUNTY REVENUES FROM ALL SOURCES
DEL NORTE	$338,066	$58,979	$45,088	$11,153,524
HUMBOLDT	$2,082,244	$56,805	$167,777	$55,361,333
MENDOCINO	$1,624,301	$0	$454,615	$38,335,896
SONOMA	$5,991,453	$306,611	$613,122	$131,796,935
MARIN	$1,347,135	$250,245	$226,186	$87,123,489
SAN FRANCISCO	$57,781,194	$12,546,737	$35,266,405	$1,816,278,021
SAN MATEO	$7,490,358	$1,039,475	$939,602	$209,522,374
SANTA CRUZ	$2,769,040	$391,051	$451,646	$79,000,750
MONTEREY	$2,365,366	$1,880,881	$1,647,915	$108,791,473
SAN LUIS OBISPO	$2,278,548	$772,581	$600,720	$72,418,205
SANTA BARBARA	$2,593,022	$1,212,515	$1,959,245	$132,792,543
VENTURA	$4,150,782	$0	$14,477	$216,786,144
LOS ANGELES	$37,594,587	$10,132,099	$1,769,311	$3,684,318,070
ORANGE	$11,278,662	$0	$593,783	$613,278,634
SAN DIEGO	$10,250,223	$859,383	$769,867	$690,625,538

SOURCE: STATE CONTROLLER OF CALIFORNIA, 1982-83.

TABLE 3B-21

COASTAL CITY GOVERNMENT REVENUES RELATED TO TOURISM
1982-1983

CITY	SALES & USE TAXES	PARK AND RECREATION FEES	TRANSIENT LODGING TAXES	TOTAL CITY REVENUES FROM ALL SOURCES
CRESCENT CITY	$518,457	$0	$125,426	$3,690,350
EUREKA	$3,301,414	$98,131	$458,903	$27,242,369
FORT BRAGG	$605,555	$0	$164,922	$2,013,256
SAN FRANCISCO	$57,781,194	$12,546,737	$35,266,405	$1,916,278,221
HALF MOON BAY	$378,089	$43,847	$91,238	$2,158,837
SANTA CRUZ	$3,691,844	$556,639	$609,317	$27,839,540
CAPITOLA	$1,314,247	$0	$54,637	$2,951,314
MONTEREY	$3,352,149	$191,764	$3,045,038	$19,828,321
CARMEL	$1,062,415	$34,832	$1,330,332	$4,428,550
SANTA BARBARA	$7,589,160	$640,060	$1,355,714	$58,288,258
CARPINTERIA	$500,393	$7,016	$125,623	$2,434,303
VENTURA	$7,294,434	$481,143	$530,760	$54,033,532
LOS ANGELES	$189,750,990	$7,717,004	$18,184,286	$3,073,178,369
SANTA MONICA	$9,951,323	$356,721	$1,236,979	$85,833,126
MANHATTAN BEACH	$2,282,240	$391,447	$206,991	$15,155,380
REDONDO BEACH	$3,092,878	$378,989	$366,594	$31,320,911
HUNTINGTON BEAC	$10,276,823	$812,871	$179,183	$85,381,254
LONG BEACH	$19,068,649	$1,417,745	$1,667,355	$508,400,553
NEWPORT BEACH	$6,802,227	$484,847	$1,598,274	$43,010,585
LAGUNA BEACH	$1,221,426	$225,135	$768,210	$14,374,529
SAN CLEMENTE	$1,290,766	$1,018,829	$70,521	$15,576,376
OCEANSIDE	$3,347,166	$202,237	$294,557	$41,657,783
DEL MAR	$362,535	$0	$98,809	$3,785,462
SAN DIEGO	$58,138,595	$679,003	$11,882,169	$410,919,504

SOURCE: STATE CONTROLLER OF CALIFORNIA, 1982-83.

TABLE 3B-22

IMPORTANCE OF COASTAL TOURISM TO COASTAL COUNTIES' ECONOMIES
1980

COUNTY	DIRECT VISITOR EXPENDITURE (1)	TOTAL EMPLOYMENT GENERATED (2)	TOTAL INCOME GENERATED (3)	% OF TOTAL EMPLOYMENT (4)	% OF SERVICE SECTOR EMPLOYMENT (5)
DEL NORTE	$2.20	73.00	$1.40	1.19	6.28
HUMBOLDT	$29.30	1,037.00	$19.30	2.54	6.91
MEDOCINO	$105.60	3,651.00	$69.30	15.13	48.72
SONOMA	$176.60	6,933.00	$132.10	6.97	21.24
MARIN	$358.00	13,428.00	$252.60	17.87	43.00
SAN FRANCISCO	$366.20	13,317.00	$253.00	2.24	5.22
SAN MATEO	$195.90	7,829.00	$148.70	3.01	8.51
SANTA CRUZ	$219.00	8,271.00	$156.10	13.00	37.95
MONTEREY	$211.50	8,292.00	$157.30	6.24	23.37
SAN LUIS OBISPO	$170.20	6,419.00	$121.60	12.76	37.81
SANTA BARBARA	$170.30	6,621.00	$125.70	4.88	11.87
VENTURA	$185.60	6,997.00	$132.00	3.90	14.39
LOS ANGELES	$557.70	26,008.00	$499.20	0.69	1.57
ORANGE	$457.20	19,853.00	$373.60	2.27	6.31
SAN DIEGO	$455.90	18,148.00	$343.40	2.19	7.00
TOTAL	$3,675.20	146,537.00	$2,784.30	1.37	3.38

SOURCE: APPLIED ECONOMIC SYSTEMS, AUGUST 1985.

NOTES:
(1) MILLIONS OF 1982 DOLLARS, VISITORS FROM OUTSIDE THE COUNTY.
(2) TOTAL DIRECT, INDIRECT AND INDUCED WAGE AND SALARY EMPLOYMENT.
(3) TOTAL DIRECT, INDIRECT AND INDUCED INCOME IN MILLIONS OF 1982 DOLLARS.
(4) COMPARED TO TOTAL WAGE AND SALARY EMPLOYMENT FOR 1980.

TABLE 3B-23

MAJOR CALIFORNIA BEACHES BY COUNTY AND GEOPIECE
1979 - 1980

COUNTY	BEACH	BEACH NUMBER	BEACH LENGTH (FEET)	OIL VARIABLE VALUE	ACTUAL ATTENDANCE 7/1/79-6/30/80
DEL NORTE COUNTY					
	GEOPIECE 319				
	PELICAN STATE	1	975	0.00	
	CLIFFORD KAMPH	2	300	0.00	
	KELLOG	3	800	0.00	
	PEBBLE BEACH	4	3,000	0.00	
	CRESCENT CITY	5	3,960	0.00	
	GEOPIECE 3				
	REDWOOD NATL-DN	6	15,840	0.00	
	DEL NORTE COAST	7	5,280	0.00	
HUMBOLDT COUNTY					
	GEOPIECE 4				
	PRAIRE CREEK	8	31,680	0.00	
	GEOPIECE 320				
	DRY LAGOON	9	31,800	0.00	
	BIG LAGOON	10	1,000	0.00	55,000
	PATRICK'S PT	11	13,800	0.00	[illegible]
	TRINIDAD	12	8,800	0.00	43,[illegible]
	LUFFENHOLTZ	13	1,000	0.00	[illegible]
	MOONSTONE	14	1,500	0.00	30,000
	GEOPIECE 321				
	LITTLE RIVER	15	4,000	0.00	
	CLAM BEACH	16	15,000	0.00	[illegible]
	MAD RIVER	17	5,000	0.00	35,000
	SOMOA PEN ACC	18	18,480	0.00	50,000
	FIELD'S LANDING	19	300	0.00	
	BOAT RAMP CTY PK	20	1,000	0.00	25,000
	SOUTH SPIT	21	19,480	0.00	50,000
	TABLE BLUFF	22	1,000	0.00	
	CRAB COUNTY	23	300	0.00	4,000
	GEOPIECE SUM				
	GEOPIECE 322				
	CENTERVILLE CTY	24	15,840	0.00	30,000
	MATTOLE	25	5,280	0.00	
	GEOPIECE 9				
	KINGS RANGE	26	21,120	0.00	
MENDOCINO COUNTY					
	GEOPIECE 325				
	SINKYONE WILDERNESS	27	29,844	0.00	4,878
	GEOPIECE 326				
	WESTPORT UNION	28	17,310	0.00	49,577
	WAGES	29	2,112	0.00	
	GEOPIECE 327				
	MACKERRICHER	30	41,187	0.00	673,344
	JUG HANDLE	31	7,400	0.00	35,255
	CASPER	32	2,400	0.00	
	RUSSIAN GULCH	33	7,630	0.00	57,071
	MENDOCINO HD	34	10,000	0.00	[illegible]
	VAN DAMME	35	1,700	0.00	[illegible]
	GEOPIECE 328				
	NAVARRO	36	3,000	0.00	14,500
	MANCHESTER	37	11,670	0.00	60,991
	FISH ROCK	38	3,960	0.00	

TABLE 3B-23 (CONTINUED)

MAJOR CALIFORNIA BEACHES BY COUNTY AND GEOPIECE
1979 - 1980

COUNTY	BEACH	BEACH NUMBER	BEACH LENGTH (FEET)	OIL VARIABLE VALUE	ACTUAL ATTENDANCE 7/1/79-6/30/80
SONOMA COUNTY					
	GEOPIECE 362				
	GUALALA	39	2,640	0.00	
	SALT POINT	40	31,362	0.00	87,524
	STILLWATER	41	2,112	0.00	
	FORT ROSS	42	5,000	0.00	
	SONOMA COAST	43	59,420	0.00	1,009,575
	WESTSIDE	44	10,560	0.00	144,224
	DORAN CTY	45	10,560	0.00	186,892
MARIN COUNTY					
	GEOPIECE 369				
	DILLON BEACH	46	5,280	0.00	
	GEOPIECE 137				
	PT REYES	47	180,224	0.00	1,427,418
	GEOPIECE 370				
	TOMALES BAY	49	12,800	0.00	70,094
	STINSON	49	3,110	0.00	
	MT. TAM	50	10,800	0.00	
	MUIR BEACH	51	1,594	0.00	
	TENNESSEE	52	1,040	0.00	373,201
	RODEO	53	2,640	0.00	1,721,240
	KIRBY COVE	54	1,056	0.00	
SAN FRANCISCO COUNTY					
	GEOPIECE 140				
	BAKER	55	2,640	0.00	792,577
	CHINA BEACH	56	1,000	0.00	0
	LAND'S END	57	1,040	0.00	3,419,157
	OCEAN BEACH	58	24,288	0.00	1,268,000
SAN MATEO COUNTY					
	GEOPIECE 376				
	SHARP PARK	59	5,300	0.00	
	GREYWHALE COVE	60	360	0.00	15,516
	MONTARRA	61	4,000	0.00	109,820
	FITZGERALD RES	62	15,840	0.00	93,575
	HALF MOON BAY	63	11,025	0.00	1,177,798
	SAN GREGORIO	64	4,900	0.00	368,014
	POMPONIO	65	8,250	0.00	131,711
	PESCADERO	66	9,700	0.00	307,991
	BEAN HOLLOW	67	9,806	0.00	207,929
	ANO NUEVO	68	37,530	0.00	88,415
SANTA CRUZ COUNTY					
	GEOPIECE 410				
	BIG BASIN	69	3,828	0.00	
	GEOPIECE 411				
	NAT'L BRIDGES	70	5,000	0.00	401,615
	SANTA CRUZ CITY	71	5,280	0.00	
	TWIN LAKES	72	1,073	0.00	612,423
	CAPITOLA	73	3,280	0.00	
	NEW BRIGHTON	74	5,000	0.00	222,581
	SEACLIFF	75	7,000	0.00	505,506
	MANRESA	76	9,500	0.00	830,886
	SUNSET	77	20,001	0.00	536,931

TABLE 3B-23 (CONTINUED)

MAJOR CALIFORNIA BEACHES BY COUNTY AND GEOPIECE
1979 - 1980

COUNTY	BEACH	BEACH NUMBER	BEACH LENGTH (FEET)	OIL VARIABLE VALUE	ACTUAL ATTENDANCE 7/1/79-6/30/80
MONTEREY COUNTY					
	GEOPIECE 413				
	ZMUDOWSKI	78	9,124	0.00	182,951
	MOSS LANDING	79	4,730	0.00	603,755
	SALINAS RIVER	80	6,400	0.00	333,999
	GEOPIECE 204				
	MARINA	81	4,650	0.00	
	GEOPIECE 414				
	MONTEREY ST & CTY	82	4,691	0.00	
	ASILOMAR	83	6,100	0.00	
	CARMEL CITY	84	4,500	0.00	
	CARMEL RIVER	85	9,700	0.00	234,110
	POINT LOBOS	86	23,777	0.00	281,344
	ANDREW MOLERA	87	14,050	0.00	
	GEOPIECE 209				
	JULIA P. BURNS	88	11,800	0.00	88,179
	JOHN LITTLE	89	[illegible]	0.00	
	LOS PADRES NATL FORE	90	11,088	0.00	
SAN LUIS OBISPO COUNTY					
	GEOPIECE 420				
	W.R.HEARST	91	773	0.00	227,584
	SAN SIMEON	92	19,200	0.00	356,888
	CAYUCOS	93	1,650	0.00	
	MORRO STRAND	94	6,250	0.00	55,206
	GEOPIECE 421				
	ATASCADERO	95	9,850	0.00	103,755
	MORRO BAY	96	39,515	0.00	[illegible]
	MONTANA DE ORO	97	19,200	0.00	223,435
	PORT SAN LUIS	98	22,500	0.00	735,000
	AVILA	99	3,045	0.00	
	PISMO	100	32,370	0.00	1,209,152
SANTA BARBARA COUNTY					
	GEOPIECE 431				
	RANCHO GUADALUPE	101	792	0.22	
	GEOPIECE 241				
	POINT SAL	102	4,600	0.00	9,665
	OCEAN BEACH	103	2,640	0.00	
	GEOPIECE 432				
	JALAMA	104	1,584	0.00	
	GEOPIECE 433.1				
	GAVIOTA	105	27,600	0.61	180,852
	REFUGIO	106	14,100	0.31	130,048
	EL CAPITAN	107	9,420	0.37	327,141
	GEOPIECE 433.2				
	ISLA VISTA	108	529	0.72	
	GOLETA	109	1,320	0.48	
	ARROYO BURRO	110	581	0.79	
	SANTA BARB CITY	111	23,760	1.51	1,060,500
	LOOKOUT	112	633	2.51	
	GEOPIECE 433.3				
	CARPINTERIA CTY	113	1,056	3.39	
	CARPINTERIA ST	114	4,115	2.94	373,651

TABLE 3B-23 (CONTINUED)

MAJOR CALIFORNIA BEACHES BY COUNTY AND GEOPIECE
1979 - 1980

COUNTY	BEACH	BEACH NUMBER	BEACH LENGTH (FEET)	OIL VARIABLE VALUE	ACTUAL ATTENDANCE 7/1/79-6/30/80
VENTURA COUNTY					
	GEOPIECE 435				
	RINCON BEACH	115	2,640	1.97	61,840
	HOBSON	116	1,848	1.81	13,880
	FARIA	117	2,640	1.50	17,020
	GEOPIECE 437				
	EMMA K. WOODS	118	14,440	0.48	141,588
	SAN BUENAVENTURA	119	23,760	0.16	
	MCGRATH	120	10,445	0.09	168,368
	MANDALAY	121	3,168	0.09	
	SILVER STRAND	122	4,752	0.08	
	GEOPIECE 438				
	POINT MUGU		19,224	0.00	601,603
LOS ANGELES COUNTY					
	GEOPIECE 439				
	LEO CARILLO		10,104	0.00	673,930
	NICHOLAS CNYN		1,848	0.00	
	ZUMA		10,560	0.00	7,125,245
	PT DUME		7,613	0.00	
	CORRAL		2,376	0.00	408,400
	MALIBU		2,950	0.00	568,016
	LAS TUNAS		1,560	0.00	
	TOPANGA		6,336	0.00	610,450
	WILL ROGERS		15,675	0.00	4,099,903
	GEOPIECE 440.1				
	SANTA MONICA N.		8,764	0.00	7,742,766
	SANTA MONICA S.		6,072	0.00	9,089,334
	VENICE		14,500	0.00	4,828,074
	DOCKWEILER		11,346	0.00	1,720,343
	EL SEGUNDO		4,224	0.00	
	EL PORTO		1,215	0.00	
	MANHATTAN		10,950	0.00	2,176,187
	HERMOSA		8,450	0.00	3,626,750
	REDONDO		7,030	0.00	3,692,144
	TORRANCE		3,960	0.00	1,860,200
	GEOPIECE 440.2				
	MALAGA COVE		792	0.00	
	POINT VICENTE		1,584	0.00	
	ABALONE COVE		6,336	0.00	155,279
	ROYAL PALMS		4,678	0.00	
	PT FERMIN		4,224	0.00	
	GEOPIECE 440.3				
	CABRILLO		4,118	0.00	3,162,625
	BELMONT SHORE		20,660	1.21	
ORANGE COUNTY					
	GEOPIECE 448				
	SEAL BEACH		4,488	1.99	
	SUNSET&SURF		9,708	1.71	
	BOLSA CHICA		27,607	1.50	2,239,278
	HUNTINGTON CITY		26,400	1.10	4,950,000
	HUNTINGT.STATE		10,900	0.78	2,293,380
	NEWPORT		13,860	0.19	
	SANTA ANA		5,280	0.00	
	BALBOA		13,860	0.00	
	CORONA DEL MAR		1,584	0.00	
	LITTLE CORONA		1,056	0.00	

TABLE 3B-23 (CONTINUED)

MAJOR CALIFORNIA BEACHES BY COUNTY AND GEOPIECE
1979 - 1980

COUNTY	BEACH	BEACH NUMBER	BEACH LENGTH (FEET)	OIL VARIABLE VALUE	ACTUAL ATTENDANCE 7/1/79-6/30/80
	GEOPIECE 449				
	CRYSTAL COVE		16,800	0.00	
	CRESCENT BAY		868	0.00	
	FISHERMAN COVE		510	0.00	
	LAGUNA		8,430	0.00	
	ALISO		858	0.00	
	COAST ROYAL		2,810	0.00	
	THREE ARCH		1,430	0.00	
	NIGUEL		1,430	0.00	
	DOHENY		6,567	0.00	594,286
	CAPISTRANO		1,124	0.00	
	SAN CLEMENTE		12,904	0.00	
	SAN CLEMENTE ST		6,000	0.00	533,465
SAN DIEGO COUNTY					
	GEOPIECE 311				
	SAN ONOFRE STATE		24,880	0.00	722,701
	GEOPIECE 457				
	OCEANSIDE CITY		14,784	0.00	
	CARLSBAD CITY		2,500	0.00	
	CARLSBAD		[illegible]	0.00	1,187,877
	SOUTH CARLSBAD		[illegible]	0.00	[illegible]
	LEUCADIA		[illegible]	0.00	[illegible]
	SEASIDE GARDENS		[illegible]	0.00	[illegible]
	MOONLIGHT		1,[illegible]	0.00	1,[illegible]
	SEA CLIFF		500	0.00	[illegible]
	SAN ELIJO		9,170	0.00	[illegible]
	CARDIFF		[illegible]	0.00	1,[illegible]
	TIDE		[illegible]	0.00	[illegible]
	SOLANO		[illegible]	0.00	43,[illegible]
	DEL MAR CITY		[illegible]	0.00	
	TORREY PINES SB		[illegible]	0.00	842,100
	BLACK'S		4,488	0.00	[illegible]
	SCRIPP'S		[illegible]	0.00	[illegible]
	LA JOLLA SHORES		2,904	0.00	2,[illegible]
	GEOPIECE 458				
	BOOMER		[illegible]	0.00	
	WHISP SANDS		488	0.00	
	WINDANSEA		6,600	0.00	
	NORTH PACIFIC		[illegible]	0.00	[illegible]
	SOUTH PACIFIC		[illegible]	0.00	1,[illegible]
	MISSION		10,885	0.00	2,754,080
	SOUTH MISSION		880	0.00	[illegible]
	MISSION BAY BEACHES		75,900	0.00	[illegible]
	OCEAN BEACH		2,840	0.00	2,[illegible]
	OCEAN CITY BEACHES		[illegible]	0.00	
	SAN DIEGO BAY		[illegible]	0.00	
	CORONODO		[illegible]	0.00	
	SILVER STRAND		[illegible]	0.00	388,807
	IMPERIAL BEACH		[illegible]	0.00	
	BORDER FIELD		6,040	0.00	114,915

CONSTRUCTED FROM DATA PROVIDED BY:
CALIFORNIA DEPARTMENT OF PARKS AND RECREATION, 1979-80
CALIFORNIA CITIES AND COUNTIES, 1979-80

TABLE 3B-24

COUNTY BOATING FACILITIES AND REGISTRATION
1982

COUNTY	REGIS-TRATION	MOORINGS	BERTHS	DRY STORAGE	LAUNCH LANES	HOISTS
DEL NORTE	751	146	825	0	4	2
HUMBOLDT	3,691	654	390	0	13	8
MENDOCINO	2,386	25	323	15	4	1
SONOMA	9,276	26	515	57	8	3
MARIN	7,135	107	4,199	475	21	14
CONTRA COSTA	25,293	4	743	160	5	4
ALAMEDA	24,546	119	4,726	336	31	20
SAN FRANCISCO	3,757	53	1,497	50	10	9
SAN MATEO	12,128	202	2,723	693	12	5
SANTA CRUZ	4,477	0	1,000	170	4	4
MONTEREY	5,217	111	925	30	6	5
SAN LUIS OBISPO	5,896	516	143	324	4	6
SANTA BARBARA	6,533	1	1,003	25	8	8
VENTURA	14,074	0	3,521	510	16	9
LOS ANGELES	91,143	640	16,959	873	69	32
ORANGE	46,133	266	10,997	2,067	51	29
SAN DIEGO	35,015	71	6,109	955	49	22

SOURCE: DEPARTMENT OF NAVIGATION AND OCEAN DEVELOPMENT, DECEMBER 1982.

TABLE 3B-25

FISHING STRUCTURES AND BOATING FACILITIES BY GEOPIECE
1982

AREA FACILITY	STRUCTURE	NUMBER OF BOATING FACILITIES (1)
DEL NORTE COUNTY		
GEOPIECE 319		
CRESCENT CITY HARBOR	PIER	905
GEOPIECE 3		
PANTHER CREEK RESORT		66
HUMBOLDT COUNTY		
GEOPIECE 320		
TRINIDAD HARBOR	PIER	400
GEOPIECE 321		
HUMBOLDT BAY		613
KING SALMON RESORT	PIER	5
SOUTH SPIT AND JETTY	JETTY	
MENDOCINO COUNTY		
GEOPIECE 327		
NOYO HARBOR	PIER	283
ALBION RIVER		80
SONOMA COUNTY		
GEOPIECE 362		
TIDES MOTEL WHARF	WHARF	
BODEGA BAY HARBOR	PIER	265
DORAN COUNTY PARK	PIER	
MARIN COUNTY		
GEOPIECE 369		
LAWSON'S LANDING	PIER	188
GEOPIECE 137		
GOLDEN HINE BOAT SHOP		139
SAN FRANCISCO COUNTY (2)		
SAN MATEO COUNTY		
GEOPIECE 376		
SHARP PARK BEACH	PIER	
PILLAR POINT HARBOR	PIER	200
EAST BREAKWATER	BREAKWATER	
SANTA CRUZ COUNTY		
GEOPIECE 411		
SANTA CRUZ WHARF	WHARF	
SANTA CRUZ HARBOR	PIER	1100
SANTA CRUZ BEACH	WHARF	
TWIN LAKES STATE BEACH	JETTY	
CAPITOLA FISHING WHARF	WHARF	
SEACLIFF STATE BEACH	PIER	

TABLE 3B-25 (CONTINUED)

FISHING STRUCTURES AND BOATING FACILITIES BY GEOPIECE
1982

AREA FACILITY	STRUCTURE	NUMBER OF BOATING FACILITIES (1)
MONTEREY COUNTY		
GEOPIECE 413		
MOSS LANDING BEACH	JETTY	
MOSS LANDING HARBOR		515
GEOPIECE 414		
MONTEREY WHARF	WHARF	551
FISHERMAN'S WHARF	WHARF	
COASTGUARD WHARF	WHARF	
LOVER'S POINT	PIER	
SAN LUIS OBISPO COUNTY		
GEOPIECE 420		
W.R. HEARST BEACH	PIER	
CAYUCOS STATE BEACH	PIER	
GEOPIECE 421		
CITY T-PIER	PIER	50
PORT SAN LUIS	PIERS	458
AVILA STATE BEACH	PIER	
PISMO BEACH PIER	PIER	
MORRO BAY		472
SANTA BARBARA COUNTY		
GEOPIECE 433B		
SANTA BARBARA HARBOR	PIER	1034
STERN'S WHARF	WHARF	
VENTURA COUNTY		
GEOPIECE 437		
SAN BUENAVENTURA	PIER	
VENTURA HARBOR		1898
PORT HUENEME BEACH	PIER	12
LOS ANGELES COUNTY		
GEOPIECE 439		
MALIBU	PIER	
GEOPIECE 440 A		
SANTA MONICA BEACH	PIER	90
VENICE	PIER	
MARINA DEL REY HARBOR		6414
MANHATTAN BEACH	PIER	
HERMOSA BEACH	PIER	
KING HARBOR		876
REDONDO PIER	PIER	
REDONDO BEACH	PIER	659
MONSTAD PIER	PIER	

TABLE 3B-25 (CONTINUED)

FISHING STRUCTURES AND BOATING FACILITIES BY GEOPIECE
1982

AREA FACILITY	STRUCTURE	NUMBER OF BOATING FACILITIES (1)
GEOPIECE 440C		
CABRILLO FISHING PIER	PIER	
LOS ANGELES HARBOR		5388
WHALER'S WHARF	WHARF	
LONG BEACH HARBOR		1913
BELMONT PIER	PIER	
ALAMITOS BAY		3159
ORANGE COUNTY		
GEOPIECE 448		
SEAL BEACH	PIER	
HUNTINGTON HARBOR	PIER	2439
TRINIDAD ISLAND	PIER	
SUNSET AQUATIC PARK		
HUNTINGTON PIER	PIER	2439
NEWPORT BEACH	PIER	
NEWPORT HARBOR		3088
BALBOA BEACH	PIER	
JETTY VIEW PARK	JETTY	
BALBOA ISLAND		10
CORONA DEL MAR STATE B	JETTY	
GEOPIECE 449		
ALISO BEACH COUNTY PAR	PIER	
DANA POINT HARBOR	JETTY	2815
SAN CLEMENTE	PIER	
SAN DIEGO COUNTY		
GEOPIECE 457		
OCEANSIDE HARBOR	PIER	739
OCEANSIDE PIER	PIER	
AGUA HEDIONDA LAGOON	PIER	
GEOPIECE 458		
SCRIPP'S PIER	PIER	
PACIFIC BEACH PARK	PIER	
MISSION BAY MARINAS	PIERS	2592
SAN DIEGO BAY MARINAS	PIERS	5386

(1) BOATING FACILITIES INCLUDE MOORINGS, BERTHS AND DRY STORAGE AREAS ADJACENT TO LAUNCHING FACILITIES.
(2) BOATING FACILITIES INSIDE SAN FRANCISCO BAY ARE EXCLUDED

SOURCE: DEPARTMENT OF NAVIGATION AND OCEAN DEVELOPMENT
CALIFORNIA COASTAL ACCESS GUIDE

TABLE 3B-26

RESIDENT FISHING LICENSES BY COUNTY
1982

COUNTY	TOTAL LICENSES
DEL NORTE	11,209
HUMBOLDT	34,871
MENDOCINO	22,416
SONOMA	37,362
MARIN	32,379
SAN FRANCISCO	69,741
SAN MATEO	42,343
SANTA CRUZ	24,908
MONTEREY	29,889
SAN LUIS OBISPO	47,325
SANTA BARBARA	39,952
VENTURA	49,815
LOS ANGELES	473,247
ORANGE	109,594
SAN DIEGO	127,030

SOURCE: CALIFORNIA DEPARTMENT OF FISH AND GAME, 1985.

H. IMPORTANT TOURIST ATTRACTIONS

DEL NORTE COUNTY

Six Rivers National Forest - This national forest of 1,118,366 acres covers the eastern half of Del Norte County and offers camping, hiking, boating, swimming, fishing and riding.

Pelican State Beach - A 5-acre park with grassy dunes and an undeveloped shoreline with abundant driftwood.

Clifford Kamph Memorial Park - This park includes a blufftop picnic area and several paths to the beach.

Smith River - Part of California's Wild and Scenic River System, and one of the seven stabilized river deltas in California. Year round fishing for salmon, trout, smelt, perch, and flounder. Swimming in the upstream areas. The town of Smith River is a popular tourist attraction. Accommodations, camping, guided boat trips, water-skiing equipment, and fishing and boating supplies are all available nearby.

Smith River County Park - A pebble beach at the mouth of the Smith River, fishing and bird-watching from Pyramid Point.

Smith River Fishing Access - A picnic area, boat ramp and fishing supplies are available.

Kellogg Road Beach - A wide sandy beach with extensive dune fields and marshes.

Lakes Earl and Talawa - Two fresh water lagoons of over 2,000 acres which contain salmon and trout during periods of high water and rain. Duck hunting is permitted in season and there are two public boat ramps.

Point St. George Public Access - A long trail leads to the beach, where there are beds of littleneck, razor, and Washington clams; rock fishing and smelt netting.

Crescent City

Pebble Beach Park - Pebble Drive runs alongside the shore on a bluff overlooking the beach with several pullouts for parking and viewing. Paths leading down to the beach, which features a picnic site and historical marker of a Talawa Indian settlement.

Preston Island - A paved road leads down to a rocky spit and beach.

Brother Jonathan Park/ Vista Point - A grassy, blufftop park and historical cemetery.

Crescent City Beaches - A 3/4 mile rocky beach with three stairway accesses.

Battery Point Lighthouse - This offshore lighthouse contains a museum of early maritime artifacts and Indian relics. There are picnic tables and a view of Crescent Bay Harbor.

Beach Front Park - This beach front park runs along Crescent City harbor and features a bike path, picnic areas and recreation facilities. Del Norte County Visitors Center and Redwood National Park Information Center and Headquarters are just east of the park.

Shoreline Campground Accessway - A large campground with picnic facilities and a path to the beach.

Crescent City Harbor - One of the safest harbors on the north coast containing a public wharf, commercial fishing fleet, recreational boating facilities and restaurants.

Miller Redwood Company - Guided tours of this lumber company are offered.

Old Lighthouse - A working lighthouse and nautical museum are open to the public.

Rellim Demonstration Forest - An authentic re-creation of the early logging and lumber industry.

Undersea World - This aquarium has underwater windows.

Crescent Beach - A small beach with adjacent parking and picnic area offering access and facilities for the disabled.

Enderts Beach - A half mile trail leads to this beach where primitive campsites are available and daily tidepool walks are offered during the summer at low tide.

Redwood National Park - Established in 1968 and expanded in 1978, the park preserves coastal redwoods, including the world's tallest trees, in virgin stands as well as new growth forests. It stretches for 50 miles through Del Norte and Humboldt Counties and includes three state parks within its boundaries: Del Norte Coast Redwoods, Jedediah Smith (inland from Crescent City), and Prairie Creek Redwoods in Humboldt County. The diverse habitats of the coastal area support a diversity of wildlife. Park headquarters are in Crescent City.

Jedediah Smith Redwoods State Park - Covering 9,560 acres east of Crescent City, this park offers camping, picnicking, hiking, fishing and swimming among the redwoods and along the Smith River.

Del Norte Coast Redwoods State Park - This state park covers 6,375 acres of redwoods, beaches, and rain forest. There is camping available and a trail system leading both inland and to the coast.

Mill Creek Campgrounds - Located adjacent to the Del Norte Coast Redwoods State Park, 145 campsites are situated in a valley sheltered from ocean wind and fog. Picnic facilities, hiking trails, and fishing areas are available.

Wilson Creek Beach - A sandy beach with driftwood and tide pools; there is fishing in Wilson Creek and picnic tables are available.

Requa Overlook - A view of the Klamath River valley and the coastline with picnic sites, information displays, and a trailhead to the coastal trail which runs north along the bluffs to Lagoon Creek.

Klamath River - California's second largest river, the Klamath is famous for salmon and trout fishing. Until 1850 the Yurok Indians lived along its banks; their civilization was one of the most advanced of the California indians. Klamath celebrates its Indian heritage each summer during the salmon festival, with ceremonial dances performed by local Indians, logging contests and other activities.

Klamath River Jet Boat Cruises - The cruise covers 64 miles round trip between Klamath and Roach Creek; June 1 - September 30 only.

Coastal Drive - An winding 8 mile blufftop drive between Klamath River and Prairie Creek Redwoods State Park in Humboldt County.

HUMBOLDT COUNTY

Redwood National Park - Established in 1968 and expanded in 1978, the park preserves coastal redwoods, including the world's tallest trees, in virgin stands as well as new growth forests. It stretches for 50 miles through Del Norte and Humboldt Counties and includes three state parks within its boundaries: Del Norte Coast Redwoods, Jedediah Smith (inland from Crescent City), and Prairie Creek Redwoods in Humboldt County. The diverse habitats of the coastal area support a diversity of wildlife. Park headquarters are in Crescent City.

Prairie Creek Redwoods State Park - Within the boundaries of Redwood National Park, this 12,384-acre state park offers three campgrounds, numerous hiking and nature trails, fishing streams and a herd of Roosevelt Elk.

Orick Beach Fishing Access - At the mouth of Redwood Creek, with fishing for salmon and steelhead trout and picnic sites.

Redwood Creek Beach County Park - A beach at the mouth of Redwood Creek.

Freshwater Lagoon - Boat ramp and a beach at the north end.

Stone Lagoon - An enclosed coastal lagoon.

Dry Lagoon State Park - A sand spit and knolls are situated between the ocean, Stone and Big Lagoons. Primitive campsites, a boat ramp are available and four-wheel drive vehicles are permitted on the beach.

Big Lagoon County Park - This park is located on a marsh adjacent to the ocean and includes a campground, picnic areas and a boat ramp.

Patrick's Point State Park - This 462-acre blufftop park includes campgrounds, hiking trails, overlooks, and a natural history and Indian museum.

Trinidad Roadside Rests - Turnoff points on Highway 101 featuring nature exhibits, dog runs and picnic areas.

Trinidad State Beach - A public beach on the north side of Trinidad Point with picnic areas and hiking trails. There is also access to the beach from Humboldt State University Marine Lab, which offers marine exhibits and an aquarium and is accessible to disabled persons.

Trinidad Harbor - This small harbor contains recreational boating facilities and a restaurant.

Luffenholtz Beach County Fishing Access - A scenic overlook with trails to the beach.

Moonstone County Park - This broad sandy beach features good clamming.

Little River State Beach - Also a broad sandy beach, with access to the Little River delta.

Azalea Reserve - Trails and exhibits in a reserve of azaleas.

Clam Beach County Park - Four wheel drive vehicles are allowed on this beach.

McKinleyville Vista Point - A panoramic view of Trinidad complemented by a small picnic area.

Mad River Beach County Park - This ocean beach offers a boat ramp and picnic areas.

Arcata Boat Ramp - A two lane boat ramp and picnic site.

Arcata Youth Hostel - This overnight facility includes beds, shower, kitchen, bike storage and rental.

Eureka

North Spit - A long sandy beach separating Arcata Bay from the ocean. Includes a boat launch and dunes.

Humboldt Bay - California's second largest enclosed bay is home to a large fishing and lumber industry. The Humboldt Bay National Wildlife Refuge includes most of the south bay and some mudflats, marshes, and islands in the north bay.

Humboldt Bay Harbor Cruise - A 75 minute trip on Humboldt Bay.

Eureka Mooring Basin - A small craft harbor with boat ramps and docking facilities.

Fort Humboldt State Historic Park - This park offers picnic areas and a logging museum.

Clarke Memorial Museum - This museum displays Indian and pioneer artifacts.

Samoa Cookhouse Museum - A museum of artifacts from the early lumber and logging industry.

Sequoia Park - A 52-acre grove of redwoods that also features a duck pond, petting zoo, and wildlife areas.

Pacific Lumber Co. - This lumber company offers self-guided tours.

King Salmon Resort - A recreational boating facility with charter boats, trailer camping and a beach.

Field's Landing County Boat Launch - A public two lane launching facility.

South Spit and Jetty - This public fishing access is open year long.

Table Bluff County Park - A small park on the south shore of Humboldt Bay.

Eel River - The Eel River delta area contains many roadside accesses.

Crab County Park - This fishing area has access to the ocean, dunes and river delta.

Centerville Beach County Park - A four-acre park with ocean front reaching from the mouth of the Eel River to False Point.

Mattole River and Beach - There is only pathway access to this beach.

King Range National Conservation Area - 54,000 acres of coastal mountains and shoreline. This is a primitive area with very few roads. There are campgrounds and hiking trails; it is possible to hike the entire coastline from Mattole River to Shelter Cove.

Shelter Cove - A privately owned portion of the King Range National Conservation Area. There are 3 oceanfront accesses to this beach and many recreational facilities are available including a boat launch and surfing.

MENDOCINO COUNTY

King Range National Conservation Area - 1,620 acres of this primitive coastal area stretches from Humboldt into Mendocino County.

Mendocino National Forest - Covering more than 1,000,000 acres, this forest has campgrounds, hiking trails, picnic areas, boating, fishing, swimming and horseback riding.

Sinkyone Wilderness State Park - This 3,600-acre park includes undeveloped beaches, bluffs, coastal mountains, redwood forests, spectacular coastal views and hiking trails.

Westport Union Landing State Beach - Blufftop picnic areas and a wide sandy beach are found here.

Wages Creek Beach - A sandy ocean beach at the mouth of Wages Creek, adjacent to the beach is a privately run campground.

Chadbourne Gulch - This rocky cobble beach is popular for surf fishing and seal watching.

Bruhel Point Bluff - Scenic views of the rocky coastline are found on several paths along the blufftop.

South Kibesillah Gulch Fishing Access - A steep path leads to a popular rock fishing beach and tidepools.

Seaside Creek Beach - A small undeveloped ocean beach.

MacKerricher State Park - Six miles of sandy beach and dunes include boat ramps, equestrian trails, and fishing.

Fort Bragg

Noyo Harbor - A sandy ocean beach at the mouth of the Noyo River; fishing equipment rentals and charter boats are available.

Mendocino Coast Botanical Gardens - 47 acres of botanical gardens on a coastal terrace above the ocean, with nature trails through the lush native and exotic vegetation and to the adjoining headlands and beach.

California Western Railroad - A scenic 40 mile trip through redwood groves and past the Noyo River.

Stone Painting Museum - Local artisans display gemstone art and mineral sculpture.

Pygmy Forest (Little River) - Pygmy pine and cypress reservation.

Kelly House Historical Museum (Mendocino) - This 1861 restoration houses an historical library and museum of local history.

Mendocino Art Center - A local art gallery featuring exhibits and festivals year round.

Jug Handle State Reserve - Within the reserve there are 5 miles of nature trails, and a sandy ocean beach.

Caspar State Beach - This small sandy beach is located at the mouth of Doyle Creek.

Russian Gulch State Park - This park includes 30 campsites, redwood forests, a sandy beach, and 12 miles of hiking trails.

Mendocino Headlands State Park - Blufftop trails lead to a sandy beach, sea cliffs, wave tunnels and vista points.

Van Damme State Park - This state park includes a small sandy beach, a self guided nature trail, campgrounds and a pygmy forest.

Albion Flat - A private campground, sandy beach, and boat launch are found here.

Navarro River - A sandy ocean beach is found at the mouth of the Navarro River.

Elk State Beach - Scenic sea stacks can be seen only by taking the dirt path which leads to the beach.

Mallo Pass Creek Vista Point - This vista provides a view of the rocky ocean shore as well as lush oak forests.

Manchester State Beach - 972 acres of beach and dunes with trails, scattered driftwood and a campground 1/2 mile from the beach.

Point Arena Cove - This small rocky beach has boating facilities, equipment rentals and a lighthouse.

Fish Rock Beach - This popular fishing and diving access has a private campground, fishing, a long sandy beach and tidepools.

Collins Landing - A steep trail leads to the beach, a rocky cove and tidepools.

Gualala River - Many sandy beaches are located along the banks of the Gualala River.

SONOMA COUNTY

Gualala Point Regional Park - This regional park offers camping, a visitor center, picnic areas and beachfront.

Salal Trail - This trail winds through the Sea Ranch area for .76 miles.

Red Box Accessways - Privately owned accessways to the bluffs and coves.

North Horseshoe Cove - A trail from Highway 1 leads to the cove.

Kruse Rhododendron State Reserve (Plantation) - A 300-acre reserve with 5 miles of hiking trails.

Stump Beach - A picnic area within Salt Point State Park.

Salt Point State Park - A 400-acre park including campgrounds, hiking and riding trails, picnic areas and a tidepool beach.

Ocean Cove Reserve - A privately owned bluff area with campsites, fishing and diving access.

Stillwater Cove Park - A small coastal park with a stairway to the beach; includes a campground.

Timber Cove Campground - This privately owned park offers camping, boating facilities, fishing and diving access.

Kolmer Gulch - A small sandy beach accessible only by trail.

Fort Ross State Historical Park (Jenner) - A restoration of a 19th century Russian trading post which features guided tours, picnic facilities, and a small beach.

Eckert Acquisition - Several trails lead to two beaches and coves.

Russian Gulch - A pathway leads down to a small sandy beach.

North Jenner Beaches - Several beaches are reached by steep trails down eroding bluffs.

River's End - A privately owned day use facility at the mouth of the Russian River that offers camping and fishing.

Vista Points - Numerous turnoff points along Highway 1 with spectacular views of the coast.

Duncan Mills Campground - This privately owned campground near the coast on the Russian River features fishing, boat rentals, picnic areas and horse rentals.

Cassini Ranch Family Campground - A privately owned campground on the Russian River featuring tent and trailer sites, fishing, boating, picnic areas, recreation hall and horseback riding.

Sonoma Coast State Beaches - A series of beaches stretching from the Russian River to Bodega Head, offering two campgrounds.

Armstrong Redwoods/Austin Creek State Park - Fourteen miles from Jenner in Guerneville, this state park includes a redwood grove and acres of rugged hills, with a trail system, campground, and backpacking sites available.

Sonoma County Wineries - Numerous small vineyards and wineries, including Korbell in Guerneville, approximately 14 miles inland from Jenner.

Jack London State Historic Park - Located in the small inland town of Glen Ellen, this park encompasses 800 acres including the author's ranch, home and grave. The two story house contains his papers and other memorabilia.

Sonoma State Historic Park - In the town of Sonoma, a collection of historical buildings including Mission San Francisco Solano, Sonoma Barracks, and the Toscano Hotel. The town of Sonoma is a popular tourist attraction, featuring many restaurants and small shops.

Train Town - In the town of Sonoma, a 17 minute train ride through a forested railroad park.

Porto Bodega - A private boating facility with hookups for RV's.

Bodega Marine Lab -A private research facility offering guided tours on Friday afternoons.

Bodega Head State Park - This park offers spectacular views of the Marin and Sonoma coastline, as well as miles of hiking trails.

Bodega Bay Harbor - This busy port features numerous private boating facilities, shops and restaurants.

Westside County Park - This day use boating area features a boat launch, campground and picnic areas.

Doran County Park - This park offers 138 camping sites in addition to picnic facilities , a boat launch and an ocean fishing pier.

MARIN COUNTY

Dillon Beach - A small sandy beach with picnic area .

Walker Creek - At the north end of Tomales Bay, a sensitive marshland habitat and migratory waterfowl habitat administered by four cooperating chapters of the Audubon Society.

Miller Park Boat Launch - A small boat launch and picnic facility on Tomales Bay.

Tomales Bay State Park - Adjacent to the Point Reyes National Seashore, this park offers walk-in campsites, hiking, boating, fishing, clamming, and includes the Tomales Bay Ecological Reserve, a 500-acre reserve for migrating wildfowl and other wild life.

Shield's Marsh - Audubon Canyon Ranch land with a trail that leads into the marsh, with a view of Tomales Bay.

Golden Gate National Recreation Area - Administered by the National Park Service, this area includes Point Reyes National Seashore, Mount Tamalpias, Muir Woods and Beach, the Marin Headlands, and the San Francisco shoreline. There are miles of beaches, campgrounds, hiking trails and scenic overlooks.

Point Reyes National Seashore - One of only seven national seashores in the country, the 64,000-acre Point Reyes National Seashore is a remote and rugged peninsula separated from the rest of Marin County by the San Andreas Fault rift zone. This famous recreational area offers over 100 miles of trails, 4 walk-in campgrounds, numerous beaches, interpretive nature programs and a Miwok Indian Village.

Point Reyes Bird Observatory - Located at the southernmost end of the park, this is the only full time ornithological research station in the United States and is open to the public.

Agate Beach - A small beach in the town of Bolinas, at the end of Elm Road .

Duxbury Reef - Accessible from Agate Beach, this nature reserve offers limited public fishing and tidepools.

Bolinas Overlook - A spectacular vista from Duxbury Reef south.

Bolinas Lagoon Nature Reserve - This migratory waterfowl habitat can be viewed from Highway 1 or from Olema Bolinas Road.

Audubon Canyon Ranch - This private nature reserve and educational center is a nesting site for the egret and great blue heron and offers a picnic area, information center, and a trail to an upland viewing platform.

Stinson Beach - A popular broad sandy beach with picnic area and food service.

Mount Tamalpais State Park (Mill Valley) - This 6,204-acre state park in Mill Valley includes beaches and a popular trail system.

Muir Beach - A small, sandy beach.

Muir Woods National Monument - A 550-acre redwood preserve just 17 miles northwest of San Francisco.

Marin County Civic Center - A 160-acre project including fairgrounds, theaters, a lake and water conservation garden.

Marin Wildlife Center (San Rafael) - A center for the treatment and shelter of wild animals.

Mission San Rafael Arcangel - This replica of the original mission offers a self guided tour.

Marin Headlands - These former military lands now offer hiking through grassy hills and valleys, beaches, campgrounds and spectacular views of the San Francisco and the bay area.

Tennessee Valley Beach - A small sandy beach on Tennessee Cove which can be reached by hiking trails.

Rodeo Beach - This small beach has an information center, guided walks and the California Marine Mammals Center.

Golden Gate Hostel - This 60 bed facility offers low overnight rates, bicycle storage rooms, and horse stables.
Slide Ranch - Open for day use only, Slide Ranch offers environmental education programs.

Kirby Cove - Accessible by foot at the end of a dirt road, this small beach in the Marin Headlands offers picnic areas, overnight camping, and firepits with a view of San Francisco and the Golden Gate Bridge.

SAN FRANCISCO COUNTY AND CITY

Alcatraz Island - Formerly a federal prison, Alcatraz is now administered by the National Park Service. Guided tours of "The Rock" are available.

Golden Gate Bridge - One of the longest single span suspension bridges ever built, the bridge connects San Francisco to Marin County.

Fort Point National Historical Site - Now a historical point of interest, Fort Point was once the principal defense bastion of the West coast. Located beneath the Golden Gate bridge, tours are offered daily.

Coastal Trail - This trail begins at Fort Point National Historic Site underneath the Golden Gate Bridge and follows steep coastal cliffs and ends at the Cliff House.

Baker Beach - This sandy city beach offers picnic and barbeque facilities.

China Beach - A steep path leads to the beachfront, where one can find showers, a sundeck and picnic areas.

Land's End - A war memorial overlooking the Pacific Ocean and Golden Gate area.

Lincoln Park - A magnificent view of the Golden Gate area, as well as an 18 hole golf course and the California Palace of the Legion of Honor, a fine arts museum.

Golden Gate Park - Covering 1,017 acres, the park offers many miles of trails and bridle paths, tennis courts, a golf course, and an outdoor music concourse. Also located in the park are the M. H. De Young Museum, Asian Art Museum, California Academy of the Sciences, Morrison Planetarium, Japanese Team Garden, and Strybing Arboretum.

Ocean Beach - A 4 mile strand of city beach adjacent to Golden Gate Park with bike paths and horseback riding.

San Francisco Zoological Gardens - Animals, birds, a large gorilla exhibit, and a newly opened primate center.

Lake Merced / Harding Park - Featured here are a boat launch, rowboat rentals, par course, food services and a golf course.

Fort Funston -A popular hang gliding spot with a steep trail leading to the beach below.

Burton Beach - A sandy city beach with access from Fort Funston or Thornton beach.

Cable Car Barn Museum - A museum of San Francisco's early transit system including old photos, models and relics.

Chinatown - This is the center of San Francisco's Chinese community, contained within approximately 16 square blocks.

Chinese Historical Society of America - Exhibits depicting the role of Chinese immigrants in the settlement of the western U.S.

Civic Center - A monumental grouping of federal, state and city structures and parklands covering more than eight city blocks.

Cliff House - A scenic overlook with a view of Seal Rocks; restaurants, a visitor center and viewing platform are available.

Cow Palace - The largest indoor stadium west of Chicago.

Exploratorium - This interactive and educational museum offers exhibits in the fields of mathematics, science, technology, animal behavior and human perception.

Fisherman's Wharf - Along the waterfront are many excellent restaurants,markets and souvenir shops.

Fort Mason Center - A former World War II army base which has been transformed into a cultural center including theater, galleries, studios, classrooms, and an international youth hostel.

Jeremiah O'Brien - Under current restoration, this is one of the last World War II liberty ships still in operating condition.

Guinness Museum of World Records - Displays of record breaking people and events.

Haas Lilienthal House - A furnished Queen Anne victorian mansion open for guided tours.

Japan Center - A cultural center featuring the Peace Pagoda, plazas, fountains, gardens and restaurants.

Lombard Street - A particularly steep and winding street between Hyde and Leavenworth, a popular tourist attraction.

The Mexican Museum - Changing and permanent exhibits devoted to pre-hispanic, colonial, folk and fine arts from Mexico.

Mission San Francisco De Asis - One of the oldest buildings in San Francisco, the mission features a small museum and mixed architectural styles.

National Maritime Museum - Displays of the history of water transportation from 1800's to the present .

Balclutha - A preserved square rigger at Pier 43.

Hyde Street Pier - A floating museum of historic ships dating from the late 19th century .

North Beach - An informal neighborhood in the vicinity of Telegraph Hill; noted for restaurants, cafes, bookshops and art galleries.

Old St. Mary's Church - An historical church in the Chinatown neighborhood.

Old U.S. Mint - Restored to its 1800's appearance, the Old Mint offers guided tours, and painting and sculpture exhibits.

Palace of Fine Arts - A re-creation of the original structure at the 1915 Panama - Pacific Exposition.

Presidio - Established in 1776, this is one of the oldest military installations in the U.S.

Ripley's Believe It or Not - A museum of the bizarre and unusual.

St. Mary's Cathedral - A modernistic structure of Italian marble, aluminum and gold.

San Francisco Art Institute - Artworks are displayed in three different galleries.

San Francisco Fire Department Museum - More than 100 years of S.F.F.D. history are depicted through displays of equipment and relics.

Treasure Island Museum - Displays and murals depicting the history of the Navy, Marine Corps and Coast Guard from 1813.

Wax Museum - Wax figures of many famous and historical figures.

Wells Fargo History Room - This museum of the gold rush era contains a stage coach, gold nuggets, mining relics and other memorabilia.

Whittier Mansion - Home of the California Historical Society, this is a museum of turn of the century events and lifestyles.

Acres of Orchids (South San Francisco) - Displays of a large variety of orchids which are bred through a cloning process.

SAN MATEO COUNTY

Thornton State Beach - This popular kite and glider area offers blufftop hiking trails, a steep path to the beach and picnic facilities with panoramic coastal views.

Palisades and Northridge City Parks - These parks contain municipal playgrounds which overlook the ocean.

Daisaku Ikeda Canyon - A steep 1/2 mile long trail leads to the canyon and beach below.

Mussel Rock City Park - A stairway leads to the beach from the steep hazardous bluffs above.

Sharp Park State Beach - Sharp Park offers a 200 yard municipal fishing pier, concession stand and bait shop.

San Pedro Beach Rest Area - This beach is popular for surfing and has outdoor showers.

Gray Whale State Beach - This clothing optional beach is accessible only by private stairway.

Coyote Point Museum (San Mateo) - This interactive nature museum displays various ecosystems of the San Mateo area.

San Mateo County Historical Museum - A museum of local history and culture featuring exhibits of logging industry, architecture, transportation and agriculture.

Montara State Beach - A steep path leads to 1/2 mile of sandy beach.

Montara Lighthouse Hostel - This low cost, 30 bed facility features kitchen, laundry and bike facilities.

James Fitzgerald Marine Reserve - A famous 3 mile stretch of beach with exceptional tidepools. Guided nature walks and picnic areas are available.

Pillar Point Harbor - A popular municipal fishing pier located on Half Moon Bay with recreational boating facilities, picnicking and food services.

Half Moon Bay

Half Moon Bay State Beaches - A system of beaches along the coast of Half Moon Bay. Facilities include camping, horseback riding and picnic sites.

SAN MATEO COUNTY

Ralston Hall (Belmont) - Built in 1868, this 80 room Italian villa was the home of William Chapman Ralston. Guided tours of this elegant mansion are available.

Dunes Beach and Venice Beach - Beaches with access over a rough dirt road.

Francis Beach - 50 campsites and picnic sites overlooking the ocean.

Overlooks - Highly eroded blufftops provide access to spectacular views of the coastline.

Martin's Beach - This privately developed fishing cove is popular for surf smelt fishing.

Allied Arts Guild (Menlo Park) - A re-creation of an Old World neighborhood where local artisans practice their crafts.

Lane Publishing Co. (Menlo Park) - The publishers of famous Sunset magazine offer guided tours of magazine offices and testing kitchens.

Stanford University (Palo Alto) - This world famous university offers guided tours of the campus, which includes the following attractions: Hoover Tower, Leland Stanford, Jr. Museum, Stanford Art Gallery, Stanford Linear Accelerator Center and Stanford Memorial Church.

Lathrop House (Redwood City) - This restored house is an example of early Gothic Revival architecture and is furnished in period (1863).

Marine World / Africa U.S.A. (Redwood City) - A 65-acre recreation complex featuring performing animals, animal exhibits, and amusement park rides.

San Gregorio Private Beach - A clothing optional beach located at the end of a private toll road.

San Gregorio State Beach - A large sandy cove with highly eroded cliffs and dangerous rip currents.

Pomponio State Beach - A long sandy beach with picnic and barbecue facilities.

Pescadero State Beach - This one mile long stretch of beach has picnic sites scattered throughout.

Pescadero State Preserve - An undeveloped wildlife sanctuary which is noted for its diversity of migratory waterfowl.

Pebble Beach - This beach is noted for its unique pebble composition; it is situated in a small cove surrounded by bluffs.

Bean Hollow State Beach - This beach is noted for rocky surf and dangerous riptides; picnic tables are available .

Butano State Park - This is a 2200-acre redwood park with hiking trails, campgrounds and scenic views of Ano Nuevo Island.

Pigeon Point Lighthouse Hostel - A 30 bed facility with kitchen and bike storage.

Gazos Creek Beach - This beach is accessible by a short pathway.

Ano Nuevo State Reserve - This 700-acre preserve is a protected breeding ground for the northern elephant seals, California sea lions, and harbor seals. Annual breeding of the elephant seals is from December through March when the reserve is open only to guided tours. Also popular for bird watching and California gray whale sighing in January and March.

SANTA CRUZ COUNTY

Big Basin Redwoods State Park - Covering over 14,000 acres in the Santa Cruz mountains, Big Basin was founded in 1902 and is the oldest park in the state system, featuring many old-growth stands of redwoods. The park offers 40 miles of hiking trails, many waterfalls, horseback riding, camping and various wildlife. Waddell Creek Beach is located at the southwest corner of the park with a harbor seal rookery offshore.

Greyhound Rock Fishing Access - A steep trail leads to this popular rock fishing spot.

Bonny Doon Beach - A steep trail leads to this beach situated in a sheltered cove.

Red White and Blue Beach - This private fee nudist beach is open for day use and overnight camping.

Wilder Ranch State Park - Ordinary beachfront and a dairy museum are found here.

Roaring Camp and Big Trees Narrow Guage Railroad (Felton) - An 1880 steam train makes a 6 mile round trip into the Redwoods of Santa Cruz County.

Santa Cruz

Natural Bridges State Beach - This 54-acre beach has scenic overlooks, rock formations, tidepools and picnic areas. It is also a noted butterfly study area.

West Cliff Drive - Panoramic views of the Pacific Ocean and Monterey Bay; parking and benches are provided.

Santa Cruz Hostel - This overnight facility is operated during summer months only.

Nearys Lagoon City Park - This nature refuge has a wildlife sanctuary, picnic area, tennis courts and children's playground.

Lighthouse Point City Park - A scenic viewpoint overlooking Monterey Bay and the Pacific Ocean.

Cowell Beach - This popular swimming beach has volleyball nets.

Santa Cruz Municipal Wharf - Over 1/2 mile long, this pier offers boat rentals, fishing equipment and boat launch facilities.

Santa Cruz Beach Boardwalk - The boardwalk features an amusement park, shops and galleries, entertainment and restaurants.

Santa Cruz Beach and Boardwalk - This popular swimming beach is located adjacent to the boardwalk described above.

Seabright Beach - A popular beach in the Santa Cruz area for surfing and swimming.

Santa Cruz Small Craft Harbor - Extensive recreational boating facilities are featured here.

Twin Lakes State Beach - An 86-acre beach with volleyball nets, picnic areas and fishing.

Lincoln Beach - A wide sandy beach located in the Live Oak section .

Sunny Cove - Another wide sandy beach in Live Oak.

Moran Lake Beach - This wide sandy beach is south of Moran Lake.

Moran Lake Park - This park consists of a nature trail on the northwest side of Moran Lake.

Pleasure Point Beach - This pocket beach is a popular surfing spot, but has no safe access due to erosion.

Joseph M. Long Marine Laboratory - A marine research and educational facility featuring tidepools, a small aquarium, and other exhibits.

Santa Cruz Art League Gallery - Exhibits featuring the work of local artisans are featured.

Capitola

Capitola City Beach - A popular swimming area with volleyball nets, benches and adjacent shops and restaurants.

New Brighton State Beach - A 68-acre state beach with campgrounds, nature trails and many species of wild birds.

Hooper Beach - A sandy beach adjacent to the Capitola Wharf.

Capitola Fishing Wharf - A free public fishing access with boat rentals and a bait and tackle shop.

Seacliff State Beach and Pier - An 85-acre park with campgrounds, picnic areas and safe ocean swimming.

Trestle Beach - The only access to this public beach is from Manresa State beach to the south.

Manresa State Beach - This 21-acre beach is famous for its Pismo clams. It is a popular surfing spot.

Sunset State Beach - This state beach has 7 miles of beachfront, but is considered unsafe for swimming. It is a popular fishing and clamming spot.

MONTEREY COUNTY

Zmudowski State Beach - This 177-acre sandy beach offers surfing, clamming and horseback riding.

Moss Landing State Beach - A 55-acre sandy beach popular for swimming and clamming.

Moss Landing Harbor - A T-shaped harbor considered to be extremely safe; commercial fishing and pleasure boating.

Moss Landing Marine Lab - A research and educational institution with public access to a beach with fishing and surfing.

Elkhorn Slough - This tidal slough is used extensively for research and educational purposes; limited clamming and pleasure boating are permitted. Two endangered bird species, the California brown pelican and the California clapper rail, are found here. Adjacent to the slough is the Elkhorn Slough Estuarine Sanctuary which includes about 1,500 acres of wetlands and uplands. A visitor center and information displays are planned.

Kirby Park - A-10 acre public fishing access with a small boat ramp.

Royal Oaks County Park - This 122-acre park offers picnic areas, tennis courts, softball field and hiking trails.

Salinas River State Beach - 246 acres of broad sandy beach, steep dunes, hiking trails; a popular fishing and clamming spot. The Salinas Wildlife Area, encompassing 518 acres owned by the U.S. Fish and Wildlife Service, is just south of the beach.

Marina State Beach - A broad sandy beach with steep dunes, this is a popular spot for fishing and hang gliding.

Roberts Lake - A small park used for model boat racing and duck feeding.

Laguna Grande Lake Accessway - An undeveloped wetland area used for jogging and picnicking.

Beach Way Access - Small parking lot and sloping sandy beach.

El Estero Park - A popular duck feeding area, this park features pleasure boat rentals, picnic sites, and the Dennis the Menace playground.

Monterey Peninsula Youth Hostel - A 60 bed facility owned and operated by the YMCA.

Monterey Beach Park - A wide sandy beach just east of the Monterey municipal wharf.

Monterey

Monterey Municipal Wharf - Built in 1926, this is the center for offloading commercial fishing vessels in Monterey.

Monterey Marina - Located west of the Municipal Wharf, the Marina offers extensive pleasure boating facilities.

Fisherman's Wharf - Adjacent to the marina, a picturesque tourist spot with restaurants, shops and galleries. Sea lions are frequently seen in the bay from here.

Monterey State Historic Park - The park includes ten historic buildings and sites in old Monterey. 19th century plays are performed in California's first theater, and a museum offers displays of California history and Indian artifacts.

Monterey Bay Aquarium - One of the largest seawater aquariums in the world whose exhibits include a kelp forest, marine mammals and the shoreline habitat.

Shoreline Park - A narrow grassy strip along Monterey Bay with benches, a walkway, a bike path, and access to several small beaches and tide pools.

Coast Guard Wharf - This is a popular area for diving; seals and sea lions are often spotted here.

Reeside Access - An access to San Carlos Beach.

Cannery Row - Formerly the site of Monterey's sardine industry, Cannery Row was made famous by John Steinbeck's novel bearing its name. It is now a popular tourist attraction featuring many shops, galleries and restaurants.

Berwick Park - Another narrow grassy park with benches and a foot path.

Lover's Point - This grassy blufftop area offers picnic areas, a fishing pier and three small protected sandy beaches. Popular surfing spot, glass bottom boat tours in the summer.

Point Pinos Lighthouse (Pacific Grove) - The reservation is a preserve for plants and wildlife; it is the site of the oldest operating lighthouse on the West Coast.

Asilomar State Beach - A rocky shoreline with dunes, tidepools and some sandy beach areas; good diving area. The non-profit Conference Grounds offer conference space and lodging.

Allen Knight Maritime Museum - A collection of maritime artifacts portrays local naval history and the whaling era.

Colton Hall - The site at which the first Constitution of California was penned.

Historical Wax Museum of Old Monterey - This collection contains figures of local historical figures set in authentic scenes.

Monterey Peninsula Museum of Art - Exhibits of regional, oriental and folk art.

Monterey Presidio - An historic military outpost founded in 1770.

San Carlos Cathedral - One of the original churches for Spanish colonists and soldiers during the 1770's.

Butterfly Trees (Pacific Grove) - These pine trees are covered with Monarch butterflies from late October to March.

Museum of Natural History (Pacific Grove) - A collection of exhibits depicting the natural history of Monterey County, including shore and aquatic birds, marine life and monarch butterflies.

Carmel

17 Mile Drive - A famous scenic drive which winds along the coast through groves of Monterey cypress and pine, with dramatic views, picnic areas, trails, wildlife and several golf courses.

Spanish Bay Picnic Area - Picnic tables and a view of Spanish Bay.

Seal and Bird Rocks Picnic Area - This viewing area has coin operated telescopes and picnic tables.

Fanshell Beach - A white sand cove used for picnicking, fishing, and swimming.

Cypress Point Lookout - This lookout area offers a magnificent view of the coast, telescopes and tidepools.

The Lone Cypress - A walkway leads down to the famous tree.

Carmel City Beach - A white sand beach bordered by cypress trees.

Carmel River State Beach - A 106-acre sandy beach with a marsh at the north end and a lagoon near the mouth of the river. The beach is a popular diving spot and the marshlands are a bird sanctuary.

Point Lobos State Reserve - This 1,276-acre preserve features spectacular views of the coastline, sandy coves and beaches, many species of wildlife and plants, tidepools and diving access. There are trails for hiking and swimming in China Cove.

Mission San Carlos Borromeo Del Rio Carmelo - This restored mission contains religious artifacts, books and documents.

Garrapata Creek Vista Point - A highway turnoff with view of the coast and Garrapata Creek. The California Sea Otter Game Refuge extends from 3 miles north of this point south into San Luis Obispo County.

Bixby Creek Bridge - One of the world's longest concrete arch span bridges, with pull-offs and spectacular views.

Andrew Molera State Park - A 2,154-acre state park of flatland, meadows and a sandy beach with campsites and hiking trails. The Big Sur River flows through the park, forming a shallow lagoon which is a bird sanctuary.

Big Sur Campground - A privately owned campground with tent rentals, cabins, picnic facilities, laundry and a playground.

Riverside Campground - Another privately owned campground with 50 campsites in the redwoods, hiking trails and laundry.

Fernwood Park Campground - A small privately owned campground with sites in the redwoods and along the Big Sur River.

Pfeiffer-Big Sur State Park - A 821-acre redwood reserve along the Big Sur River. Facilities include: 218 campsites, hiking trails, laundry, swimming, fishing, guided walks and campfire programs.

Los Padres National Forest/Ventana Wilderness - This 2 million acre National Forest has 1,750 miles of hiking trails, and extends into 5 counties. It includes part of the Big Sur Coast and the Santa Lucia Mountains.

Pfeiffer Beach - A beautiful white sandy beach surrounded by steep cliffs, sea stacks, and caves, with waves crashing through blowholes in the rock. Sycamore Creek empties onto the beach in a small lagoon. At the end of a narrow winding road and sandy trail.

Ventana Resort Campground - A privately owned campground in the redwoods, with a general store, gas station, restaurant and bar.

Julia Pfeiffer Burns State Park - An 1,800-acre park with wooded hiking trails, picnic areas and the famous Mcway waterfall.

John Little State Reserve - A state park just south of Julia Pfeiffer Burns State Park.

Esalen Institute - A privately owned holistic health center with hot springs open to the public.

Limekiln Beach Redwoods Campground - A 60 site campground with waterfalls and historic limekilns.

Kirk Creek Campground - A 33 site blufftop campground; two trails lead to a sandy beach which is a popular diving spot.

Mill Creek Picnic Ground - The picnic areas overlook the ocean; a rocky shore below is a popular diving spot.

Sand Dollar Picnic Area and Beach - This popular hang gliding area features picnic areas, cypress trees and a sandy beach.

Plaskett Creek Campground - An R.V. campsite with picnic tables and grills.

Jade Cove - This diving area is reached by a steep trail down the bluffs; nephrite jade can be found here.

Willow Creek Picnic Ground - A picnic area along the rocky shore at the mouth of Willow Creek.

Perkins Park - This sandy beach has picnic areas.

SAN LUIS OBISPO COUNTY

Los Padres National Forest - This national forest has a small portion of its territory in San Luis Obispo County. Facilities include camping, hiking, swimming, fishing and horseback riding.

Mission San Miguel Arcangel - Built in 1797 in the small town of San Miguel, this mission contains many of its original decorations and paintings.

Rios-Caledonia Adobe - One block away from Mission San Miguel Archangel in San Miguel, this old adobe was an inn for stagecoach travellers in the 1860's.

William Randolph Hearst Memorial State Park - This 8-acre park in San Simeon has picnicking facilities, boating, boat rental, fishing and swimming.

Hearst-San Simeon State Historical Monument - A 149-acre estate located at the top of a 1,600 foot peak in the Central California Coastal Range. Guided tours are available.

San Simeon State Park - Five miles south of San Simeon, this state beach contains 541 acres with camping, picnicking and fishing available to visitors.

Estrella River Winery - Located in Paso Robles; daily wine tasting and tours.

Pesenti Winery - Tours and tasting are offered daily in this winery located in Templeton.

Cayucos State Beach - This state beach has picnicking, fishing and swimming areas available in a 15.6-acre park.

Morro Strand State Beach - This 34-acre park offers picnicking, fishing and swimming. It is located north of Morro Bay.

Atascadero State Beach - This 75-acre park offers camping, swimming and fishing.

Atascadero Museum - Located in the Atascadero Administration and Veterans Memorial Building, this museum contains exhibits of local history.

Morrow Rock Ecological Preserve - A protected state preserve for the nesting of the endangered peregrine falcon, Morro Rock is 576 feet high, the northernmost of nine volcanic peaks.

Morro Bay State Park - This 2,425-acre park features a Museum of Natural History with geologic and oceanographic displays, camping, picnicking, hiking trails, boating, boat rental, fishing, swimming, a visitors' center, and food services.

Tigers Folly Harbor Cruise - In Morro Bay, one hour cruises tour the area on a stern-wheeler cruise boat.

Montana de Oro State Park - South of Morro Bay, this park consists of 7,968 acres and 1.5 miles of coastline with camping, picnicking, hiking trails, fishing and horseback riding available for visitors.

California Polytechnic State University - Located in San Luis Obispo, this campus offers daily self-guided tours of a solar-heated, wind-powered horticulture unit.

Mission Plaza - This park located in downtown San Luis Obispo has walking rails through a developed wooded creek area.

Mission San Luis Obispo de Tolusa - Built in San Luis Obispo in 1772, this mission feature artifacts from the Chumash Tribe and early California settlers.

San Luis Obispo County Historical Museum - Located in San Luis Obispo, this museum contains local historical artifacts as well as an extensive research library.

Pacific Gas and Electric Energy Information Center - Seven miles south of San Luis Obispo, this center offers tours to Diablo Canyon Nuclear Power Plant.

Avila State Beach - This 10-acre state beach offers picnicking, boating, swimming and fishing.

Pismo State Beach - Adjacent to Pismo Dunes, this state beach covers 2,065 acres and offers camping, picnicking, hiking trails, fishing, swimming and bicycle trails.

Pismo Dunes Preserve - An area of dunes restricted from vehicular use containing unique, undeveloped areas of large dunes, popular with hikers.

Pismo Dunes State Vehicular Recreation Area - This 2,500-acre state recreation area is set aside for off-road vehicular use on its sandy dunes and also offers camping, picnicking, hiking trails, fishing and swimming.

SANTA BARBARA COUNTY

Los Padres National Forest - Nearly one-half of Santa Barbara County is National Forest land which offers hiking, camping, swimming, fishing and hunting.

Channel Islands National Park - Three of the five islands in this park are in Santa Barbara County. They are: San Miguel, Santa Cruz and Santa Rosa Islands. Visitors must arrange permits and transportation to visit the national park.

Rancho Guadalupe County Park - A 26-acre park consisting of a dune habitat with several endangered bird species and plants. Site of the largest sand dune on the west coast.

Santa Maria Valley Historical Museum - Located in Santa Maria, the museum displays historical artifacts from the northern Santa Barbara County area.

Zaca Mesa Winery - This winery is located near Santa Maria and offers daily tours and wine-tasting.

Point Sal State Beach - A secluded beach with access along a rough road and steep path where harbor seals and seabirds are to be found.

Firestone Winery - Located in the small town of Los Olivos, the Firestone Winery offers tours and wine-tasting daily.

La Purisma Mission State Historic Park - This mission is located 4 miles northeast of Lompoc and is one of the most completely restored of the 21 missions in the California chain. There are nature trails for hiking and riding, and picnicking facilities at the 967-acre park.

Lompoc Museum - The Lompoc Museum has artifacts and displays detailing the history of the local area.

Nojoqui Falls County Park - Just east of US 101 as it enters the San Ynez Valley from the south is Nojoqui Falls, a waterfall of 164 feet. The county park offers picnicking and hiking trails.

Mission San Ynez - Located in the San Ynez Valley, this mission was built in 1904 and has a museum and tours.

Solvang - This small tourist-oriented town, established by Danish settlers in 1911, is unique due to its Scandinavian-style architecture.

Carey Cellars - Located in Solvang, Carey Cellars offers tours and wine-tasting daily.

Gaviota State Beach - This state beach offers camping, hiking trails, boating, fishing, swimming, riding and food service. The park covers 2,776 acres.

Refugio State Beach - This 155-acre park offers camping, picnicking, hiking trails, fishing, swimming, bicycle trails and cabins.

El Capitan State Beach - This state beach with scenic nature trails within its 133-acre boundaries offers camping, picnicking, fishing, swimming and food service to recreationers.

Isla Vista County Park and Beach - A small blufftop park overlooking a sandy beach with picnic tables.

University of California - Beaches available to university students. Also there is a natural reserve at Coal Oil Point which is restricted to scientific study due to sensitive dune habitat.

Goleta Beach County Park - A 29-acre park with a wide sandy beach, grassy picnic area, children's play area, and wetlands area popular for bird watching.

Arroyo Burro Beach County Park - A natural stream habitat and coastal bluffs covering 6 acres with picnic and recreational facilities.

La Mesa Park - 9 acres on a bluff overlooking the beach.

Shoreline Park - 15 acres overlooking the Santa Barbara Harbor and Channel with stairs leading to the shore.

Leadbetter Beach - 27 acres, a wide beach along a shallow cover with picnic facilities.

Plaza Del Mar - 5-acre park with a view of the Santa Barbara harbor.

City of Santa Barbara

Santa Barbara Harbor - A multi-use harbor and marina with extensive boating and recreational facilities and scenic views from a walkway along the breakwater.

Stearns Wharf - A Santa Barbara landmark, built in 1872 to service cargo and passenger ships, the wharf is currently the site of several shops and restaurants.

Westbeach Park - A broad beach of 11 acres with a boardwalk.

Palm Park - A 10 acre beach and grassy park with a community cultural center.

Santa Barbara Zoological Gardens - This garden contains 81 acres of exotic animals in their native habitats, picnic areas, a playground and a miniature train for kids.

Alameda Plaza - This downtown plaza features over 70 species of trees.

Alice Keck Park Memorial Garden - Just across the street from Alameda Plaza this garden has a pond and 4.5 acres of native plants.

Botanic Garden - A beautiful natural showplace with 65 acres of native California plants.

Casa de la Guerra - This old adobe building was constructed in 1828 in the downtown Santa Barbara area. It is part of El Paseo restoration project.

County Courthouse - This building of Spanish-Moorish-style architecture has a sunken garden and a tower with a 360 degree view of Santa Barbara.

Covarrubias - Built in 1817, this old adobe structure was used by Pio Pico, the last governor of the Mexican province of Alta California.

El Presidio de Santa Barbara State Historic Park - Constructed in 1782, this was the first major structure built by the Spanish in Santa Barbara.

Fremont Adobe - This adobe was built in 1836 and was used as an office by visiting Mexican ranchers.

Hill-Carillo Adobe - This is another of the historic adobes of Santa Barbara. Tours are available of this old building which which was constructed in 1826.

Historical Society Museum - This museum contains a library and historical artifacts from the local area.

Mission Santa Barbara - Founded in 1786 and completed in 1820, this mission looks across downtown Santa Barbara and out to the sea.

Museum of Art - This recently expanded building contains American and European art, and a major collection of photography.

Museum of Natural History - This museum contains exhibits of native Californian animals, birds, reptiles, plants, minerals, gems and local geology.

Santa Barbara Winery - Self-guiding tours and tasting are available daily.

City of Carpinteria

Carpinteria City Beach - A narrow, sandy beach.

Carpinteria State Beach - This 50-acre park offers camping, picnicking, fishing and swimming to visitors.

Abbey Garden Cactus and Succulent Nursery - The nursery offers daily tours of its greenhouses containing a large selection of cacti and succulent plants.

VENTURA COUNTY

Los Padres National Forest - Over one half of the acreage in Ventura County is within the boundaries of the Los Padre National Forest, located in the mountainous northern half of the county. There is a condor wildlife sanctuary and sites for swimming, fishing, hiking, camping and hunting.

Rincon Point Surfer Park - Pathway leads to a beach that is very popular with surfers.

La Conchita Beach - A small, sandy beach.

Hobson and Faria County Parks - Small parks with camping areas near the ocean.

Ojai - The small town of Ojai is a popular artist's colony and retreat that offers Shakespearean plays, an Elizabethan Faire, an annual tennis tournament and annual classical and jazz music festivals. The Ojai Valley Museum, located in the old Ventura County Fire Station contains historical artifacts from the local area.

Emma Wood State Beach - Four miles north of the City of San Buenaventura, this 116-acre park offers camping, picnicking, fishing, swimming and bicycle trails.

City of San Buenaventura

Ventura County Fairgrounds Beach - A rock beach popular for fishing, fairs runs every year in September.

San Buenaventura State Beach - This 114-acre state beach offers swimming, picnicking, fishing and bicycle trails to visitors.

Marina Park - Located on the north side of Ventura Harbor with recreational facilities, picnic sites, beach access and a bike path.

Ventura Harbor - Large inland harbor with two marinas and extensive boating facilities and supplies.

Peninsula Beach - A city beach on the south side of Ventura Harbor. Popular for surfing and swimming.

Santa Clara Estuary Nature Preserve - A sensitive marshland wildlife habitat at the mouth of the Santa Clara River.

Channel Islands National Park Visitors Center and Park Headquarters - The visitors center offers exhibits, slide shows, a film, and information about the 5-island National Park. The park includes Anacapa Island, which is part of Ventura County, San Miguel, Santa Cruz, and Santa Rosa Islands which are part of Santa Barbara County and Santa Barbara Island, which is part of Los Angeles County.

Mission Hill - The site where Padre Junipero Serra erected a huge cross and where there is now a replacement cross and a remarkable view southeast toward the Oxnard Plain and Port Hueneme, southwest out to the Channel Islands and west past the oil fields in the Ventura River Valley.

Mission San Buenaventura - Founded in 1782 and completed in 1809, this mission features a museum.

Ventura County Historical Museum - This museum is one block from the mission in San Buenaventura and contains exhibits on the local native Californians and Spanish and American Settlers. It also has a research library.

McGrath State Beach - Between the cities of San Buenaventura and Oxnard, this state beach offers camping, swimming and fishing. There are 295 acres of parkland.

California Oil Museum - With displays related to the history of the oil industry in California, this museum is located in Santa Paula.

Mandalay County Park - In Oxnard, 104 acres of beach and dunes, no facilities.

Silver Strand Beach - In Oxnard, a city beach with lifeguards in the summer.

Point Hueneme Beach Park - A large beach with extensive parking, picnic sites and fishing pier.

Civil Engineer Corps/Seabee Museum - In Port Hueneme, the CEC/Seabee Museum presents models of equipment, battle scenes and historic artifacts.

Point Mugu Wildlife Sanctuary - A protected lagoon with no public access but viewing from a nearby vista point.

Point Mugu State Park - Fifteen miles south of Oxnard, Point Mugu has 14,980 acres with camping, picnicking, hiking trails, fishing and swimming available.

LOS ANGELES COUNTY

Channel Islands National Park - One of the five islands that make up this park is a part of Los Angeles County. This island is Santa Barbara Island. Transportation and permits must be obtained before visiting the island. A self-guiding tour of the island is available.

Angeles Crest and Angeles Forest Highways - These scenic highways wind through the San Gabriel Mountains and provide views (weather and smog permitting) out to the ocean beyond the Los Angeles Plain.

Angeles National Forest - In the northwestern and central eastern parts of Los Angeles County, the Angeles National Forest contains numerous hunting, fishing, skiing, hiking and camping areas.

General Motors Assembly Division - In Van Nuys, tours of this automobile assembly plant are offered.

Descanso Gardens - In La Canada-Flintridge these gardens contain over 100,000 camellias from all over the world. There is a Japanese tea garden and thousands of other varieties of flowers in the garden.

Canoga Mission Gallery - This arts and crafts gallery in Canoga Park exhibits work whose theme is early California days.

Forest Lawn Memorial Park - This memorial park in Glendale is 300 acres of landscaped rolling hills dotted with marble statuary and many other exhibits

California Institute of Technology - The Jet Propulsion Laboratory is located on this campus and is the site of the assembly and tracking of the space-ship Voyager. This campus also provides extensive research facilities for seismologists, geologists, and engineers. It is located in Pasadena. Tours of the Institute are available.

Kidspace - Kidspace is a participatory museum for children aged 2-12. The museum offers special programs and is designed to enthuse and enlighten the children who visit. Kidspace is located in Pasadena.

Norton Simon Museum - Works of art by Monet, Renoir, Van Gogh and other other artists from the early Renaissance to the present are available for viewing. The museum is located in Pasadena.

Pacific Asia Museum - Historical, cultural and art exhibits of the Far East and Pacific Island are featured in this museum in Pasadena.

Rose Bowl - The Rose Bowl in Pasadena is the site of the famed Rose Bow NCAA football game every New Year's Day, as well as local sporting events.

Columbia and Paramount Studios - Located in Hollywood along with 60 other independent film studios, Columbia and Paramount attract sightseers hoping to get a glimpse of some of the film stars who work there.

Hollywood Bowl - In the Hollywood Hills, this famous natural amphitheatre features concerts and a museum with memorabilia from the many shows and plays that have been presented there.

Hollywood Museum - The Hollywood Museum contains costumes and photographs of many famous movie stars.

Francis E. Fowler, Jr. Foundation Museum - European and Asiatic fine arts are displayed in this Beverly Hills Museum.

Greystone Park - This park in Beverly Hills surrounds a 55-room mansion (closed to the public) with 18.5 acres of wooded landscape, gardens and walkways.

Leo Carrillo State Beach - With 1,602 acres of beach area near the Ventura County line, Leo Carrillo State Beach offers camping, swimming and fishing.

Zuma Beach County Park - The largest beach owned by L.A. County with ample parking, recreational facilities, and food concessions. Popular for surfing.

Westward Beach Point Dume State Beach - Good surfing, swimming, and diving with tidepools. 35 acres of Point Dume is planned for an Ecological Reserve.

Corral State Beach - A narrow beach used for diving and surfing.

Malibu Lagoon State Beach - Popular swimming and surfing beach adjacent to Malibu Pier.

Malibu Pier - Built in 1903 and reconstructed in 1946, there are extensive recreational boating facilities here.

Las Tunas State Beach - Narrow sandy beach below a bluff.

Topanga State Beach - Narrow sandy beach with popular surfing area.

Santa Monica Mountains National Recreation Area - This national recreation area contains 150,000 acres of scenic landscape between the Ventura County line and Griffith Park. The southern boundary of the area consists of 50 miles of beaches.

Malibu Creek State Park - 4,000 acres in the Santa Monica Mountains with hiking trails and picnic facilities.

Topanga Canyon State Park - 9,000 unspoiled acres with woodland and meadows, trails, and a picnic area. Views of the San Fernando Valley and the ocean.

Will Rogers State Historic Park - In Pacific Palisades, this park has picnic facilities and hiking trails on the 190 acres around the late humorist-writer's home.

J. Paul Getty Museum - This museum is located on the Pacific Coast Highway in Pacific Palisades, with a view of the ocean. It houses many Greek, Roman and European artworks and the building itself is a re-creation of a famous Roman country house, the Villa de Papiri.

Palisades Park - Located on a bluff overlooking the Santa Monica Beach with a long walkway, benches and a recreation center for seniors.

Adobe de Palomares - This adobe was built in Pomona in the early 1850's and is currently restored and furnished with authentic furniture and decorations.

Palisades Park - Located on a bluff overlooking the Santa Monica Beach with a long walkway, benches and a recreation center for seniors.

Adobe de Palomares - This adobe was built in Pomona in the early 1850's and is currently restored and furnished with authentic furniture and decorations.

City of Santa Monica

Santa Monica Beach - An extremely wide, long, sandy beach divided in the middle by the Santa Monica pier. There are extensive recreational facilities and a bike path that begins here and continues for 17 miles south.

Santa Monica Municipal Pier - The pier features shops, restaurants, an amusement arcade and boating facilities.

City of Los Angeles

ABC Entertainment Center - Located in Century City, this center includes the Shubert Theatre, and two movie theaters.

Bradbury Building - This building was constructed in 1893 by Louis Bradbury. The building features an inner courtyard surrounded by five stories with a large skylight at the top.

Casa de Adobe - This Spanish colonial hacienda replica contains furnishing from early California days.

Chinatown - Colorful festivals and processions are often held in Chinatown. There are numerous Chinese restaurants and shops on Gin Ling Way and the surrounding area.

Civic Center - The Civic Center contains office buildings for city, county, state and federal workers.

Dodger Stadium - Built and owned by the Los Angeles Dodgers, Dodger Stadium is made specifically as a baseball stadium designed for 56,000 spectators.

El Pueblo de Los Angeles State Historic Park - The site of the city's first buildings, this 44-acre park has historical landmarks that have been restored, and is the location of Olvera Street, one of the oldest streets in the city.

Exposition Park - Houses the California Museum of Science and Industry, the Los Angeles Memorial Coliseum, Sports Arena and Swimming Stadium, and the Natural History Museum of Los Angeles County.

Farmers Market - This large central marketplace is famous for its food, clothing and gift shops and restaurants.

First Baptist Church - This church has rose windows which are replicas of the windows in the cathedral in Chartres, France and a ceiling which is a replica of a palace ceiling in Italy.

First Interstate Bank Athletic Foundation Sports Museum - Located in the Britt House (1909) this museum showcases thousands of items from the historic Helms collection.

George C. Page Museum of La Brea Discoveries - Reconstructed fossils of ice age animals are featured, including the skeletal remains of the infamous sabertooth tiger. The Rancho la Brea Tar Pits trapped these animals ages ago and preserved their fossils to the present day.

Griffith Park - Griffith Park contains numerous attractions including the Greek Theatre, Griffith Observatory and Planetarium, the Los Angeles Equestrian Center, the Los Angeles Zoo and Travel Town.

Hebrew Union College Skirball Museum - This museum contains Biblical archeological displays, Judaic art and artifacts and folk art exhibits.

Heritage Square - Still under development, Heritage Square is a showcase for Victorian buildings from Los Angeles constructed between 1865 and 1914.

Hollyhock House - This house in Barnsdall Park is considered by some as one of Frank Lloyd Wright's finest designs.

Little Tokyo - Located in the downtown area, Little Tokyo contains three Japanese shopping centers with numerous restaurants and shops.

Los Angeles Central Library - This was the last building designed by architect Bertram Goodhue.

Los Angeles County Museum of Art - This museum is made up of three buildings. One houses permanent exhibits and another has changing displays. In the third is a theatre, an outdoor cafe and educational facilities.

Los Angeles Mormom Temple - This temple (for Mormon visitors only) is one of the largest in the country.

Los Angeles Municipal Art Gallery - Alongside the aforementioned Hollyhock House in Barnsdall Park, this gallery houses traditional and contemporary art.

Los Angeles Times - Tours are available through the Los Angeles Times newspaper facility.

Lummis Home - Designed and constructed by Charles F. Lummis, founder of the Southwest Museum, Landmarks Club, Sequoia League and Southwest Archeological Society.

Museum of Contemporary Art - In Little Tokyo , this warehouse is the temporary home of the exhibits in the Museum of Contemporary Art.

Museum of Neon Art - This museum is located near Little Tokyo and features contemporary and historic neon, electric and kinetic artworks.

The Music Center - The three-theatre complex is made up of the Dorothy Chandler Pavilion, the Ahmanson Theatre and the Mark Taper Forum.

St. John's Church - This building is a duplicate of an 11th century church located in Toscanella, Italy.

St. Sophia Cathedral - This large domed cathedral is filled with murals and crystal chandeliers and has intricate stained-glass windows.

St. Vincent de Paul Church - This Spanish colonial-style building features beautiful Mexican mosaic tile.

San Antonio Winery - Tours and tasting are available at this winery.

Solar Optimum Energy House - This house was designed to demonstrate the many ways that solar energy can be used in a home to gain greater independence from centralized energy sources.

Southwest Museum - The museum displays native American art and artifacts from prehistoric times to the present.

Towers of Simon Rodia - Also called the Watts Towers, these eight concrete coated-steel rods are decorated with tile, shells and glass. Tilesetter Simon Rodia spent 33 years making these towers.

University of California, Los Angeles - UCLA, which enrolls over 32,000 students, offers many concerts and performances throughout the year. Also on the campus are the Franklin D. Murphey Sculpture Gardens, Frederick S. Wright Art Gallery, Japanese Gardens, Mildred E. Mathias Botanical Gardens and the Museum of Cultural History.

University of Southern California - USC was founded in 1880 and enrolls 29,000 students. On its campus is the Hancock Memorial Museum and University Art Galleries.

Wells Fargo History Museum - The history of the Wells Fargo Bank dates back to 1852. This museum contains many displays of historic artifacts related to the Bank's history.

Wilshire Boulevard Temple - This temple has a large domed ceiling with inlaid mosaic. There is a large rose window, Byzantine columns of black Belgian marble, bronze chandeliers and many beautiful murals.

Venice City Beach - A wide, sandy beach with a boardwalk, restaurants, shops, and recreational facilities. The Venice Pavilion features murals, picnic tables and an auditorium. There is a fishing pier nearby.

Marina del Rey Harbor - The largest artificial small-craft harbor in the world with extensive fishing and boating facilities, restaurants, shops, and hotels. Surrounding the harbor are several parks with views, walkways, fishing jetties, and beaches.

Fisherman's Village - A group of Cape Cod-style buildings on the waterfront with shops and restaurants. It attracts both tourists and local inhabitants.

Hollywood Park - Located in Inglewood, Hollywood Park is the site of thoroughbred horse racing and harness racing throughout most of the year.

The Forum - The Forum is a large sports arena located in Inglewood. It is home of the 1985 World Champion Los Angeles Lakers professional basketball team and the local professional ice hockey, tennis and indoor soccer teams.

Dockweiler State Beach - An extremely wide, sandy beach with picnic and recreational facilities

City of Manhattan Beach

Manhattan State Beach - A sandy beach with recreational facilities and a pedestrian walkway; popular for diving and surfing. A 900-foot municipal pier located nearby.

Hermosa City Beach - A wide sandy beach with recreational facilities and a pedestrian walkway. The municipal pier offers fishing supplies and a snack bar.

City of Redondo Beach

King Harbor - A municipal small-craft harbor accomodating over 1,000 boats and including a large commercial-recreational area. Several fishing piers are located nearby.

Seaside Lagoon - A warm saltwater swimming lagoon.

Redondo Sport Fishing Pier - Privately owned pier with equipment sales and rentals.

Redondo Plaza Park - Grassy park on a bluff overlooking King Harbor.

Redondo Beach Municipal Pier - Offers commercial facilities, restaurants, and shops.

Veterans Park - A 6-acre park with stairs leading to Redondo Beach.

Redondo State Beach - Unusually wide sandy beach with volleyball and a walkway.

Torrance County Beach - Just south of the City of Torrance; parking, diving.

South Coast Botanic Garden - Located on the Palos Verdes Peninsula, 2,000 species of plants can be viewed.

Palos Verdes Estates Shoreline Preserve - 130 acres with paths, scenic overlooks and steep footpaths to the shoreline which is rocky, has tidepools, and is popular for diving and surfing.

Point Vicente Fishing Access - Path to a rocky beach which is popular for fishing. Just north is a lighthouse with a panoramic view of the coast and an interpretive center.

Marineland - Offers aquariums, shows, and exhibits. Admission charge.

Abalone Cove County Beach - Path leads down to the beach which is a popular diving and surfing spot. Across Palos Verdes Drive is an unusual chapel designed by Lloyd Wright, son of Frank Lloyd Wright. Just east is an ecological preserve with steep cliffs and tidepools.

Royal Palms State Beach - Majestic palms and garden terraces remain from a hotel washed away in the 1920s. Popular for surfing and tidepools.

Point Fermin Park and Lighthouse - 37 acres overlooking Los Angeles Harbor with picnic facilities, a playground, an amphitheatre, and a community center.

Fort MacArther - Fort MacArther overlooks the man-made harbor of the Port of Los Angeles from San Pedro.

Cabrillo Marine Museum - At this museum in San Pedro, there are interpretive displays in 34 seawater aquariums that specialize in local marine life. There is a stillwater beach and a fishing pier nearby.

Ports O'Call Village and Whaler's Wharf - A re-creation of an old California seaport with shops, restaurants, and entertainment which includes helicopter rides and several cruiseship lines.

Los Angeles Maritime Museum - This museum contains local nautical historical artifacts. It is located in John S. Gibson Park, which overlooks the L.A. Harbor.

Los Angeles Harbor - Home of the nation's largest commercial fishing fleet and canning center, and one of the largest artificial harbors in the world, this harbor covers 7,000 acres of land and water with 28 miles of waterfront.

City of Long Beach

Long Beach Harbor - In the eastern part of San Pedro Bay, with extensive cargo-handling facilities, charterboats and cruises, and fishing supplies.

The Queen Mary - Permanently berthed in Long Beach, the Queen Mary is the largest passenger ship ever built. It is now a tourist attraction with a hotel on board.

Queensway Bay - Recreational boating, water-skiing, and swimming, with hotels and restaurants along its shores.

Long Beach City Beach - A very long, broad, and sandy beach inside the breakwater with little surf. Parking and recreational facilities.

Bluff Park - A long grassy park above the city beach with benches, walkways and stairways down to the beach.

Alamitos Bay State Park - A sandy and rocky beach with a boardwalk, popular for surfing. Also includes a sanctuary for the endangered California least tern.

Alamitos Bay - Contains 3 marinas with extensive boating and fishing facilities; waterskiing and swimming in the bay.

Long Beach Marina - Public berths and boating facilities. Events include an annual Christmas parade of lighted boats. Seaport Village offers waterfront restaurants and shops.

Marine Stadium - Built for the 1932 Olympics, this long rectangular body of seawater is now used for commercial water sporting events.

Colorado Lagoon - A tidal lagoon with a sandy beach and playground; popular for clamming.

Santa Catalina Island - Twenty-two miles off the California coast, Catalina is a small resort island with beautiful beaches, tennis courts, a golf course, pier, camping and deep-sea fishing. Also on the island are the Catalina Museum and the Wrigley Memorial and Botanical Garden. Boats to Catalina leave from Queensway landing.

ORANGE COUNTY

Cleveland National Forest - Part of the Cleveland National Forest is located in the mountainous eastern corner of Orange County. Swimming, fishing, hiking and camping are available at sites within the forest.

La Habra Children's Museum - This museum is designed to involve children in participating with the numerous exhibits there.

Knott's Berry Farm - Located in Buena Park, this amusement park features rides, attractions, restaurants and entertainment in the atmosphere of the Old West.

Movieland Wax Museum - In Buena Park, over 200 wax figures of movie and television stars are displayed.

Museum of World Wars and Military History - War memorabilia dating back to the Civil War are displayed in this Buena Park museum.

Anaheim Convention Center - Large exhibitions, concerts and sporting events are held in the center located in Anaheim.

Anaheim Stadium - The California Angels professional baseball team and the Los Angeles Rams professional football team both play here.

Disneyland - Located in Anaheim, Disneyland is one of the main tourist attractions in California. The amusement park is the creation of the late Walt Disney and features live entertainment and many rides and other attractions.

Hobby City Doll and Toy Museum - The museum is housed in a half-scale replica of the White House. Inside there are more than 3,000 dolls and toys. The museum is located in Anaheim.

Old Towne Orange - Built around a circular plaza, Old Towne Orange consists of many turn-of-the century buildings at the heart of the City of Orange.

Tucker Wildlife Sanctuary - Also in the City of Orange is the Tucker Wildlife Sanctuary which has an observation deck with views of the local area.

Crystal Cathedral of the Reformed Church in America - This steel "space-frame" building has 10,000 mirrored windows. The building was designed by architect Philip Johnson and is located in Garden Grove.

Bowers Museum - Located in Santa Ana, the Bowers Museum houses early California paintings and historic artifacts.

Seal Beach - A beach with a pier, popular for surfing and fishing.

Briggs Cunningham Automotive Museum - This museum in Costa Mesa has about 100 sports, classic and racing cars dating back to the early 1900's.

Lion Country Adventure Park - Lion Country Adventure Park includes shows, rides, a petting zoo and a trail through a tropical garden. It is located in Irvine.

City of Huntington Beach

Huntington Harbor - A private harbor with public commercial boating facilities and several public beaches.

Sunset Aquatic Regional Park - A public small boat harbor with paths and picnic sites adjacent to Seal Beach National Wildlife Refuge.

Bolsa Chica State Beach - 164 acres with picnicking, fishing, swimming, bicycle trails and food service facilities. Inland from the beach is Bolsa Chica Ecological Reserve, containing 1,200 acres of marshland in which three endangered bird species can be seen.

Huntington City Beach - Lifeguard on duty, site of international surfing competition.

Huntington State Beach - At the southeast edge of the City of Huntington Beach, the state beach contains 78 acres with facilities for picnicking, swimming, fishing, bicycle riding, and food service.

Santa Ana River Trail - A trail following the Santa Ana River.

City of Newport Beach

Newport Beach - A beach over 5 miles long offering recreational facilities, outdoor showers, a boardwalk and pier.

Newport Harbor - A large harbor with private and commercial boating facilities.

Newport Harbor Showboat Cruises - A 45-minute and 90-minute cruise of Newport Harbor is available throughout the year.

Upper Newport Bay Ecological Reserve - Estuary and mudflat wildlife reserve.

Balboa Beach - An ocean beach extending along the southern end of the peninsula in Newport Beach. A grassy park, Peninsula Park, is adjacent, with picnic areas.

Newport Dunes Aquatic Park - On upper Newport Bay, this park contains a 20-acre lagoon, game courts, picnic facilities, boat launching ramps and swimming areas.

Corona Del Mar State Beach - Just east of the entrance to Newport Harbor, a popular beach with facilities and a jetty.

Sherman Library and Gardens - This 2-acre cultural center and botanic garden displays tropical and subtropical plants. There is a research library of southwestern history, a Tea Garden and a touch and smell garden.

City of Laguna Beach

Pocket Beaches - Several small coves with beaches.

Main Beach - A long sandy beach with picnic and recreational facilities.

Aliso Beach County Park - Popular surfing beach and inland area with concessions, recreational facilities, and walkways.

Irvine Bowl Park - Local artists display their works here in the Festival of Arts and the Pageant of the Masters.

Laguna Beach Museum of Art - Contemporary and historical art by artists in the region are displayed.

Salt Creek Beach Park - Beach area with picnic and barbeque facilities, popular for surfing.

Mission San Juan Capistrano - Founded in 1776 by Padre Junipero Serra, this mission had three separate churches. Currently two have been restored.

Dana Point Harbor - Extensive boating and recreational facilities with a Marine Life Refuge, grassy areas with picnic tables, a stillwater swimming area, shops, and restaurants.

Doheny State Beach - With 62 acres located 1 mile south of Dana Point, this state beach offers its visitors camping, picnicking, fishing, swimming, a visitors center and food services. Doheny State Marine Life Refuge is offshore.

City of San Clemente

San Clemente City Beach - A long beach with a municipal pier and a number of accesses.

San Clemente State Beach - Contains 110 acres of beach area with camping, picnicking, hiking trails, fishing and swimming.

SAN DIEGO COUNTY

Cleveland National Forest - In the mountains in the central part of San Diego County, the Cleveland National Forest offers hiking, camping, swimming and fishing to visitors.

Palomar Mountain State Park - This state park contains 1,897 acres with camping, picnicking, hiking trails and fishing available to visitors.

Palomar Observatory - There are five domes at the top of Palomar Mountain which make up Palomar Observatory.

Anza-Borrego Desert State Park - Surrounding the town of Borrego Springs is this 522,318-acre park in the Colorado Desert which offers camping, picnicking, hiking trails, riding trails for off-road vehicle use and bicycle trails.

Mission San Antonio de Pala - Located in the small town of Pala, this mission was originally a branch of Mission San Luis Rey de Francia, which is located in the City of Oceanside.

San Onofre State Beach - Located 2 miles south of San Clemente, this state beach contains 3,036 acres of parkland with camping, hiking trails, fishing and swimming.

City of Oceanside

Oceanside Harbor - Small craft harbor with shops, restaurants, fishing and boating supplies.

Harbor Beach - Wide, sandy beach with lifeguards during summer. A popular fishing spot.

Oceanside City Beach - A long beach that is popular for swimming, surfing with a pier, several accesses and parking.

La Salina Park and Lagoon - A park alongside a lagoon and wetlands where a variety of bird species can be sighted.

Buena Vista Lagoon - A natural reserve and bird sanctuary - fishing permitted. Macton Brown Park is located on the shore of the lagoon and offers picnic sites and views.

Camp Pendleton - On the 125,000-acre Marine Corps base is the Landing Track Museum and a self-guiding tour of many original buildings from the 1800's.

Mission San Luis Rey de Francia - Founded in 1798 by Padre Francisco de Lasuen, there is a museum located at the mission.

Carlsbad - The City of Carlsbad is a beach resort named after the famous spa in Czechoslovakia. The local area is a major center for commercial flower growing.

Carlsbad City Beach - A popular beach with many accesses.

South Carlsbad State Beach - Four miles north of Encinitas, this 135-acre state beach offers visitors camping, fishing, and swimming.

San Diego Wild Animal Park - Over 2,200 animals, including giraffes, elephants, lions, tigers, zebras and rhinoceri roam on the 1,800-acre park located in Escondido. Visitors can view the animals from a monorail train or from a hiking trail.

Bernardo Winery - Self-guiding tours and wine-tasting are available daily in this Escondido winery.

San Pasqual Vineyards - Tours on weekends are available and a tasting room is open Thursday to Sunday in this Escondido winery.

San Pascual Battlefield Historical Site - At this battle site in San Pasqual, native Californians fighting under General Andres Pico of Mexico met American troops under General Kearny in 1846. Picnic areas are available in the park.

Leucadia State Beach - A wide, sandy beach with bluffs.

Quail Botanical Gardens - In Encinitas, this chaparral garden contains rare plants and a natural bird refuge.

Encinitas Beach County Park - A swimming and surfing beach.

Moonlight State Beach - A wide sandy beach with recreational facilities.

Sea Cliff County Park - A blufftop park with stairs leading to a beach that is popular for surfing and swimming.

San Elijo State Beach - With 39 acres of beach area 1 mile south of Encinitas, San Elijo State Beach offers camping, fishing, and swimming to visitors.

Cardiff State Beach - Popular swimming and surfing beach with tidepools.

Solana Beach County Park - A popular beach with a community center and recreational facilities.

Eagle Mine - Located in Julian, a small turn-of-the century mining town, the Eagle Mine offers daily tours.

Pioneer Museum - Located in Julian, the Pioneer Museum features artifacts from the early days in this turn-of-the-century mining town.

Cuyamaca Rancho State Park - Six miles north of Descanso, this state park contains 24,677 acres. The park offers camping, picnicking, nature trails for hiking and horseback riding, fishing, winter sports and a visitors center.

Del Mar Thoroughbred Club - Horseracing is featured at this facility between July and September. It is located in Del Mar.

Del Mar City Beach - A wide, sandy beach popular for surfing, swimming, and fishing.

Torrey Pines State Beach - A wide, sandy beach popular for picnicking, swimming, fishing, and surfing.

Torrey Pines State Reserve - Violent winds off the Pacific Ocean twist the native Torrey pines into odd shapes in this reserve 1 mile south of Del Mar. There are 41 acres in the park and picnicking, swimming and fishing are available to visitors.

Scripps Aquarium-Museum - Located in La Jolla, this aquarium-museum is a part of the Scripps Institution of Oceanography which is a branch of the University of California at San Diego. The nearby Scripps beach and tidepools are part of the Scripps Shoreline Preserve and are popular for observing intertidal marine life.

Kellogg Park-La Jolla Shores Beach - Popular wide, sandy beach.

La Jolla Caves - La Jolla Caves have been carved into the sandstone cliffs by centuries of pounding waves from the Pacific Ocean.

La Jolla Museum of Contemporary Art - This art museum centers on contemporary art that displays abstract geometric form, including painting, graphics, sculptures, photography and architectural designs.

Mingei International Museum - In La Jolla, this museum displays folk art from all over the world. Mingei means "arts of the people" in Japanese.

Children's Museum of San Diego - In La Jolla, this museum encourages kids to get involved in the exhibits.

City of San Diego

Mission Bay Park - This island park has facilities for boating, boat rental, camping, fishing, picnicking and swimming.

Ocean Beach Park - A sandy beach with tidepools, popular for surfing, swimming, fishing and picnicking. There is a fishing pier at the end of Ocean Beach; from the fishing pier south are a series of small pocket beaches and tidepools with accesses, these are maintained by the city.

Sunset Cliffs Park - A path along the cliffs offering a spectacular view of the coast with stairway access to a beach below.

Commercial Basin - A small craft and commercial fishing harbor with extensive facilities.

Shelter Island - Available here is a yacht basin, a popular sandy beach with a walkway, picnic facilities, pier, and boat launch.

San Diego Bay Boat Tours - Tours of the harbor and ocean are available.

Cabrillo National Monument - This national monument commemorates the voyage of Juan Rodriguez Cabrillo, who landed near San Diego in 1542. The monument overlooks San Diego Bay and the City of San Diego to the east and the Pacific Ocean to the west. The migrating grey whales can be viewed between December and February.

Point Loma - Point Loma is at the southern tip of the western peninsula that guards the mouth of San Diego Bay. The lighthouse there was built in 1891.

Point Loma Ecological Reserve - Adjacent to Cabrillo National Monument is an underwater natural reserve.

Harbor Island - Like Shelter Island to the north, this island is a boating center with beaches, walkways, restaurants and shops.

Maritime Museum of San Diego - On board three vessels are nautical and oceanographic displays.

Seaport Village - This 14-acre complex next to the harbor attracts shoppers to three separate plazas.

Glorietta Bay Park - On Coronado Island, grassy picnic areas with a boat launch. Nearby is a full service marina with a yacht club.

Coronado City Beach - Wide, sandy beach popular for swimming, surfing and fishing.

Hotel del Coronado - Self-guiding tours are available daily at this 19th century victorian hotel. Located in Coronado this landmark hotel has a beautiful view across San Diego Bay of the City of San Diego.

Silver Strand State Beach - Five miles south of Coronado this beach park offers a picnic area, fishing and swimming. There are 428 acres of park land.

Border Field State Beach - Fifteen miles south of San Diego, Border Field consists of 680 acres with picnicking, hiking trails, fishing, swimming and riding.

Balboa Park - Balboa Park is located northeast of downtown San Diego and includes 1,158 acres of parkland and various cultural attractions. These include: the Aerospace Historical Center, the Botanical Building, the Hall of Champions, the House of Pacific Relations, the Museum of Man, the Museum of Photographic Arts, the Natural History Museum, the Reuben H. Fleet Space Theatre and Science Center, the San Diego Museum of Art, the San Diego Zoo, the Simon Edison Center for the Performing Arts, the Spanish Village Art Center, the Spreckels Organ Pavilion and the Timken Art Gallery.

Firehouse Museum - This museum, open only on weekends, features antique firefighting equipment and a collection of firefighters' helmets from all over the world.

Mission San Diego de Alcala - Founded in 1769, this mission was first situated at Presidio Hill. It was moved to its present site in Mission Valley in 1774 and subsequently destroyed by an earthquake in 1803. It was then rebuilt that same year.

Old Town San Diego State Historic Park - This 6-block area contains many of San Diego's oldest buildings.

San Diego-Jack Murphy Stadium - Three professional sports teams share Jack Murphy Stadium.

Sea World - With 110 acres of aquariums, rides, exhibits, a marina and a research and medical lab, Sea World attracts visitors from all over the world.

Serra Historical Museum and Tower Gallery - Located in Presidio Park this museum records the history of San Diego from 1562 to the present.

Villa Montezuma/Jesse Shepard House - This building houses displays of Victorian architecture and decorative arts. The building itself was built in 1887.

Whaley House - Built in 1856, this house was once a San Diego courthouse. Currently it is furnished with decorations from its earlier days.

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