STRATUS CONSULTING

Appendix J
Damage Estimate for Shoreline Recreation

Prepared for:

Cosco Busan Natural Resource Damage Assessment

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J.   Damage Estimate for Shoreline Recreation

This appendix describes the assessment of losses associated with impacts to shoreline recreation from the Cosco Busan oil spill. The term "impacts to shoreline recreation" refers to any change in the shoreline-related recreation choices people made in response to the spill. The changes people made could have included taking fewer shoreline recreation trips, recreating at different shoreline sites, or participating in different shoreline recreation activities. When people change their behavior as a result of the spill, this leads to a loss. The loss associated with the impacts is equal to the decline in the value of shoreline recreation in the San Francisco Bay Area (hereafter, Bay Area) attributable to the spill or to the amount the public would have been willing to pay to prevent the effects of the spill on Bay Area recreation.

The methods described in this appendix address shoreline recreational activities such as sunbathing, swimming, surfing, strolling, sightseeing, exercise, and wildlife viewing. The analysis does not evaluate fishing or boating losses, which are addressed in Appendix H and Appendix I, respectively. This appendix begins with an overview of the overall approach to shoreline damage estimation. Following the overview, the main elements of the shoreline assessment are described, including a telephone survey of Bay Area residents about their shoreline recreation and effects of the spill; methods for estimating the number of recreation trips lost due to the spill; methods for valuing lost trips; and results of the analysis, including an estimate of shoreline recreation damages.

J.1   Overall Damages Approach

The value of shoreline recreation-related losses attributable to the Cosco Busan oil spill was estimated using a telephone survey of Bay Area residents. The shoreline recreation survey asked residents about their recreation trips to shoreline sites in the Bay Area and about the impact of the spill on their recreation trips. Data from the survey were used to estimate an economic model of shoreline recreation, and this model was then used to estimate the lost value associated with impacts to recreation. The assessment of recreational losses involved three steps: (1) estimating the number of shoreline trips that would have been taken to shoreline sites in the Bay Area under baseline conditions; (2) estimating the decline in the number of shoreline recreation trips attributable to the spill, or the number of "lost trips"; and (3) estimating the value of a lost trip, which was multiplied by the total number of lost trips to calculate total damages.

The first step in estimating shoreline recreation damages involved calculating the number of shoreline recreation trips that would have been taken to Bay Area sites in November 2007 and subsequent months in the absence of the spill. Methods for estimating trips under baseline conditions relied on onsite sampling that was conducted in November 2008 at a selection of sites

throughout the Bay Area. The onsite sampling effort is described in Appendix G. The onsite sampling included most sites with significant levels of recreation activity. A statistical model was developed that estimated the relationship between the number of recreation trips at each site where sampling occurred and variables that influence recreation, including weather variables and a variable distinguishing weekdays and weekend days. The statistical model was used to estimate baseline trips to the sampled sites from November 2007 to June 2008 using the appropriate data for weather and weekday/weekends.

The assessment area for the shoreline recreation study was geographically larger than the onsite sampling area and included many sites that were not part of the onsite sampling effort. Specifically, the assessment area extended from Dillon Beach north of San Francisco to San Gregorio Beach south of Half Moon Bay, California. The telephone survey of Bay Area residents provided information on the number of trips taken to sites where onsite sampling did not occur. Using the telephone survey data, a ratio was calculated by dividing the total number of trips reported by survey respondents to all assessment-area sites by the number of trips reported by survey respondents to sites specifically included in the onsite sampling effort. This ratio was multiplied by the number of baseline trips estimated from the onsite sampling, resulting in an estimate of the total number of baseline trips to sites throughout the assessment area.

The number of lost trips was estimated using the estimate of baseline trips combined with information on spill impacts to recreation derived from the telephone survey. The term "lost trips" refers to the decline in the number of shoreline recreation trips attributable to the spill. The telephone survey asked respondents to specify the number of trips they typically take each month throughout the year and also asked how many fewer trips they took because of the spill. This information was used to estimate lost trips as a percent of baseline trips for those people responding to the survey. This percentage was multiplied by the total number of baseline trips to sites throughout the assessment area to estimate the total number of lost trips attributable to the spill.

The value of lost trips was estimated using a travel-cost model developed from telephone survey data. Survey respondents were asked to report the destination of several of their recent shoreline recreation trips. The trips were selected to be representative of the recreation choices of Bay Area residents under baseline conditions. Information on trips was used to develop a multiple-site travel-cost model for shoreline recreation in the Bay Area. A travel-cost model analyzes the costs people are willing to incur to reach recreation sites and estimates the amount that people are willing to pay for access to recreation sites under baseline conditions. The baseline recreation model was then adjusted to represent spill conditions. The adjusted model accounted for information about spill impacts to recreation obtained from the telephone survey. A comparison of the baseline and adjusted models was used to estimate the value for trips lost due to the spill.

Total damages were estimated by multiplying the number of lost trips by the value per lost trip. The total estimated number of lost trips was 984,451, and the average estimated value per lost

trip was $18.25 in 2007 dollars. Total estimated damages were $18.0 million in 2007 dollars. Accounting for discounting and inflation since November 2007, the total estimated present value of shoreline damages in January 2010 was $20.2 million. As noted earlier, this damage estimate does not include losses associated with boating, boat-based fishing, or shore fishing but evaluates impacts to all other shoreline recreation trips.

J.2   The Bay Area Shoreline Recreation Survey

The shoreline recreation survey was used to collect data to support two objectives: to estimate the number of trips lost due to the Cosco Busan oil spill and to develop a travel-cost model for estimating the value of lost trips. This section describes the design of the survey, including an overview of the questions included in the survey instrument; implementation of the survey, including pretesting of the survey instrument, development of the sample, the number of completed interviews, and the response rate; and the calculation of statistical weights to ensure the data collected were representative of the Bay Area population. A copy of the survey instrument is provided in Attachment 1.

J.2.1   Survey instrument

The survey was divided into four sections. The first three sections included questions about respondents' recreation trips to shoreline sites in the Bay Area. Only respondents who had visited shoreline sites for recreation at least once in the 12 months prior to the interview were asked questions from the first three sections of the survey. The final section of the survey included questions about respondents' demographic characteristics. All respondents were asked the demographic questions.

The first section of the survey asked respondents to report specific information about a representative selection of up to three of their recent shoreline recreation trips.[1] Respondents were asked only about trips that occurred during the three months prior to the time of the interview. Also, respondents were asked only about single-day trips, in other words, trips that

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1. Information about a representative selection of trips was obtained using a series of questions that varied depending on the pattern of trips reported by each respondent over the previous three months. The questions elicited information about at least one trip for each of the months in which the respondent took trips, ensuring a representative distribution of the respondent's trips across time. The questions also required respondents to provide information about either their first or last trip in a given month, a method resulting in probabilities of selection that were believed to be uncorrelated with any features of the trip, such as activity or destination. An example of this method of selecting trips could involve a respondent who took two trips during the month of the interview, three trips in the month prior to the interview, and no trips in the month before that. This respondent would be asked to report details about his or her most recent trip, as well as details about the first and last trip in the month prior to the interview.

lasted one day or less and did not involve an overnight stay away from home. The information reported about each trip included the date of the trip, the destination of the trip, the number of people who accompanied the respondent on the trip, the activities the respondent engaged in during the trip, and whether the respondent traveled to the shoreline site by car. The survey was administered between June 2008 and August 2008, and the trips reported by respondents in the first section of the survey occurred between April 2008 and August 2008.

The second section of the survey asked respondents to report the number of trips they typically take during each month of the year. This section also included a question asking whether respondents typically went to the same shoreline sites and engaged in the same types of shoreline activities during November and December as they did during the three months prior to the time of the interview. The purpose of this question was to determine whether the recreation choices reported in the first section of the survey were representative of the recreation choices respondents typically made during November and December, the months when the most significant spill impacts to recreation were likely to have occurred.

The third section of the survey included questions asking respondents about effects of the oil spill on their recreation choices. The questions asked if respondents stopped going to certain shoreline sites because of the spill or if they went less often to certain sites because of the spill. If respondents stopped going to certain sites or went to certain sites less often, they were asked to identify the affected sites. They were also asked how many fewer trips they took to the affected sites because of the spill and whether on those occasions they went to other shoreline sites instead.

The final section of the survey collected information about the demographic characteristics of respondents. These included the respondent's age; the number of people living in the respondent's household; the number of children under the age of 16 living in the respondent's household; the number of people in the respondent's household who were members of the respondent's family; and the number of landline telephone numbers in the respondent's household. The demographic characteristics also included the highest level of education the respondent achieved; whether the respondent was Hispanic; the respondent's race; whether the respondent spoke a language other than English at home and, if so, which language; the respondent's family income; and the respondent's gender. The final section of the survey also asked the respondent's zip code.

J.2.2   Survey design and implementation

The telephone survey was conducted from June 2008 to August 2008 with a sample of residents in five Bay Area counties. Implementation of the survey in the period 8 to 10 months after the spill was believed to be soon enough to allow for the accurate recollection of spill effects by

survey respondents but late enough to allow for recovery from the spill and the collection of recreation data under baseline conditions. Those eligible to be surveyed (the sample frame) included all residents of San Francisco County who were 16 years or older at the time of the survey and who had a landline telephone. It also included residents 16 years or older with a landline telephone living in parts of Marin, Contra Costa, Alameda, and San Mateo counties. The geographic area included in the sample frame is shown in Figure J.1. This area includes 104 zip codes and 2.4 million people.

The survey company Fleischman Field Research in San Francisco was retained to implement the survey. A series of training sessions were held with interviewers to rehearse the interview process and address any questions about the survey instrument. An initial 65 interviews were conducted for pretesting the survey instrument. During the pretest phase, members of the research team listened to the interviews as they were in progress and noted any difficulties in the interview script or other aspects of survey implementation. During the pretest phase, researchers clarified certain aspects of the survey approach with interviewers, for example, that recreational activities at beach or waterfront areas included only those activities whose primary purpose was the use of public shore resources and did not include activities such as dining at a seaside restaurant. During the pretest phase, researchers concluded that all aspects of the survey were working well, and no changes were made to the survey instrument or approach.

The telephone survey was conducted using random-digit dial (RDD) methods. A stratified random sample of landline phone numbers for the designated geographic area was obtained from Survey Sampling International (SSI). The approach to stratification involved dividing the geographic area sampled into two zones: areas within San Francisco and areas outside San Francisco. Telephone numbers within San Francisco were sampled at a higher rate than telephone numbers outside San Francisco to ensure that the final sample of completed interviews was evenly split between the two zones. This approach allowed losses for residents within San Francisco and losses for residents outside San Francisco to be estimated with equal precision.

The total sample included 22,449 phone numbers. Of these, 12,231 were determined to be ineligible, including disconnected numbers, business numbers, and fax numbers. The remaining sample consisted of 10,218 eligible numbers. Each eligible landline number is associated with a particular household. In order to ensure that an interview was conducted with a randomly selected individual within each household, interviewers asked to speak with the person in the household 16 years old or older who most recently had a birthday. Interviews were completed with 1,339 respondents, resulting in a response rate of 13.1%. An additional 27 respondents were eliminated from the sample during the weighting process so that characteristics of sample respondents could be matched to statistics from the U.S. Census (described below). The final sample used in the analysis included the remaining 1,312 respondents.
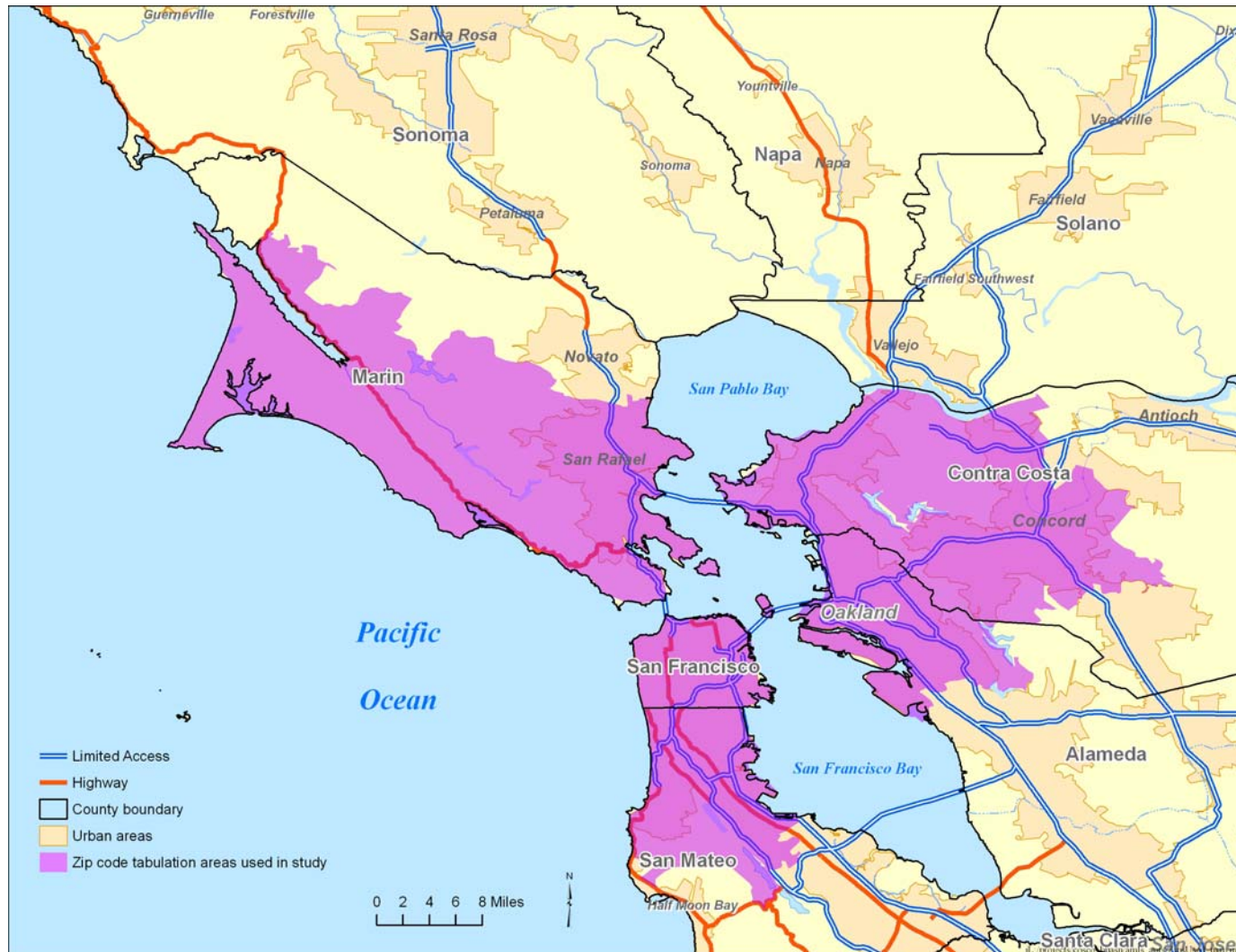
Figure J.1. Geographic area included in the sample frame.

J.2.3 Weighting survey responses

Prior to using the telephone survey data for estimating lost trips or developing a travel-cost model, survey responses were weighted to ensure that the sample was representative of residents in the target area of the survey (as shown in Figure J.1). Statistical weights were calculated to account for three factors. First, design weights compensated for unequal sample-selection probabilities that arose from the use of landline telephone numbers as the mode of contact for the survey. This ensured that differences in the number of landlines per household would not introduce bias in survey results. Second, population weights were developed to match the survey sample to population controls derived from the U.S. Census. This compensated for the oversampling of San Francisco residents that occurred in the implementation of the survey and ensured that all residents of various geographic regions and various demographic and socioeconomic groups were equitably represented in the analysis of recreation losses.

Design weights to compensate for unequal sample-selection probabilities across respondents were calculated as the inverse of the sample-selection probability for each respondent. Sample-selection probabilities were calculated as the number of landlines in the respondent's home divided by the number of adults in the respondent's household. The number of adults in the household was calculated as the total number of people in the household minus the number of children in the household. For the purpose of calculating the weights, the number of landlines in a household was truncated at two and the number of adults in a household was truncated at three.

To calculate population weights for use in matching the sample to the U.S. Census, respondents and their corresponding design weights were divided into 16 groups or "subclasses." The 16 subclasses were defined by the set of unique combinations associated with four binary variables ($2^n = 2^4 = 16$). The four binary variables were age, which was divided into those 18 to 44 years old and those 45 and older; gender, which consisted of male and female; education, which was divided into those with an associate's degree or lower and those with a bachelor's degree or higher; and zone of residence, which was divided between those living in and outside San Francisco. For example, one subclass of observations was defined by the group of respondents who were between 18 and 44 years old, were male, had completed an associate's degree or less, and lived in San Francisco. At this stage, 27 observations were removed so that respondents 16 or 17 years old were eliminated from the sample. This was necessary to develop the population weights because the U.S. Census reports separate statistics for those 18 and older in the relevant geographic area but not for those 16 and older.

Note that of the 16 subclasses, one contained a small number of observations and was therefore combined with another subclass. Specifically, the subclass defined by respondents who were between 18 and 44 years old, were male, had completed an associate's degree or less, and lived outside San Francisco had a small number of observations. This subclass was combined with the subclass of people who were between 18 and 44 years old, were female, had completed an

associate's degree or less, and lived outside San Francisco. This resulted in a total of 15 subclasses used in the final calculation of weights.

The population weighting procedure involved calculating weights that, when multiplied by the sample-selection weights previously calculated, allowed the "sample proportions" for each of the 15 subclasses to match "control proportions" from the U.S. Census. Sample proportions for each subclass were calculated as the sum of the design weights for respondents in each subclass divided by the sum of design weights for all respondents. "Control proportions" were calculated using information from the U.S. Census. Specifically, control proportions were calculated as the portion of the target population belonging to each of 15 subclasses, according to U.S. Census data. The sample selection weights for each observation in a given subclass were then multiplied by the population weights, which were the ratio of the control proportion to the sample proportion for that subclass. After this population-weighting procedure, the relative size of each subclass in the weighted sample was equal to the relative size of each subclass in the target population.

A standard weight-trimming procedure was used to truncate the final weights at the second-largest value (Kish, 1992). In other words, there were several weights of equal value that were larger than any other weights in the sample, and these were set equal to the value of the second-largest weight in the sample. Finally, the weights were rescaled so that the sum of the weights equaled 1,312, which is the total number of observations in the final sample. The weighted data were used in the calculation of all results described below.

J.3   Estimating Lost Trips

The term "lost trips" refers to the decline in trips to sites where spill impacts to recreation occurred. For each lost trip, an individual either recreates at a shoreline site outside the affected area or engages in activities other than shoreline recreation. Estimating the number of lost trips at affected sites is important to the analysis because it is a measure of the severity of spill impacts to recreation that can be incorporated into the recreation valuation model. Specifically, the baseline recreation model was modified to reflect a decline in quality at affected sites, and the severity of the quality decline was adjusted until the model's estimate of lost trips at affected sites matched the information from the survey. As described further in Section J.4, a comparison of the spill-adjusted model to the baseline model can be used to estimate the loss in value attributable to the spill.

Quantifying lost trips involved several steps. First, the number of lost trips reported by survey respondents was estimated. This estimate was used to calibrate the baseline model to spill impacts, as described in Section J.4. Second, a percentage was calculated for survey respondents reflecting lost trips to affected sites as a proportion of baseline trips to all sites throughout the

assessment area. Third, the total number of baseline trips by all recreators to all sites in the assessment area was estimated using results of the onsite sampling. Finally, the total number of lost trips by all recreators was calculated by multiplying the lost trips percentage by the total number of baseline trips. The extent of the area where spill impacts to recreation occurred is defined below. The assessment area includes all shoreline sites where respondents to the survey typically go for trips lasting a single day or less.

J.3.1 Lost trips reported by survey respondents

Questions in the telephone survey asked respondents whether they had taken any single-day recreation trips to shoreline sites in the Bay Area during the 12 months prior to the time of the interview. The survey also asked respondents whether they were aware of the oil spill that had occurred in San Francisco Bay in November 2007. Those respondents who took trips in the previous 12 months and who were aware of the oil spill were asked whether the spill caused them to stop going to certain sites or to go less often to certain sites in November 2007. Those respondents reporting effects from the spill were asked to identify the sites they avoided or went to less often and to report how many fewer trips they took to those sites because of the spill. For the times when they did not got to a particular site because of the spill, respondents were also asked whether they went to other shoreline recreation sites instead.

The responses to these questions were used to calculate lost trips for survey respondents during November 2007. The first step was determining the group of sites that were affected by the spill. For the purpose of calculating lost trips, a shoreline site was determined to be affected if at least two survey respondents indicated they took fewer trips to the site because of the spill. This approach to determining the geographic extent of spill impacts to recreation is conservative because any sites identified as impacted by only one person were excluded from the designated area and were assumed not to be affected.

For each respondent, the decline in trips to affected sites included all trips not taken to a given affected site because of the spill, net of any switching between affected sites. For example, if a respondent indicated that he or she avoided an affected site on three occasions but went to another site within the affected area on one of the occasions, this respondent was determined to have lost only two trips. Netting out any trips that involve switching between affected sites is important because switching between affected sites does not result in a decline in the total number of trips to the affected area. As noted above, the total decline in trips to affected sites is the key indicator of spill impacts to recreation used to calibrate the spill-adjusted valuation model. Switching from one affected site to another affected site occurred only rarely in the telephone survey data and likely resulted from differences in perception among respondents about spill impacts at particular sites. Lost trips to affected sites for each respondent were summed across respondents to calculate total lost trips in November 2007.

In addition to questions about spill impacts to recreation trips in November 2007, respondents were asked whether the number of their recreation trips had returned to normal following the spill. If the number of their trips had returned to normal by the time of the survey, respondents were asked in what month this happened. For each month after November and up to the month when the number of their trips returned to normal, respondents were asked how many times they would normally have gone to shoreline sites in the Bay Area but did not go because of the spill. The number of impacted trips reported in response to this last question was added across respondents to calculate a preliminary estimate of lost trips in each month after November. This preliminary estimate did not account for any switching between sites within the affected area. Since the survey did not obtain the relevant information for months after November, results for November were used to make the appropriate adjustment. Specifically, results for November indicated that the process of netting out any switching between sites led to a decline of about 5.2% in the estimated number of lost trips. An adjustment of 5.2% was therefore also applied in months after November to calculate the final estimate of lost trips in each month.

J.3.2   Lost trips as a percent of baseline trips

The estimate of lost trips for survey respondents was used to calculate the percentage decline in trips due to the spill relative to the number of trips respondents would have taken under baseline conditions. The number of baseline trips for respondents was estimated using information about the number of trips respondents typically take in a given month, as reported by respondents in the second section of the survey.

First, the number of lost trips for each respondent in a given month was compared to the number of trips the respondent typically took in that month. In some instances the number of lost trips exceeded the number of typical trips. In these instances the number of lost trips was truncated to be equal to the number of typical trips. Prior to truncation, the typical number of trips reported by each respondent for November 2007 was multiplied by 0.756 to estimate the typical number of trips on or after November 7, when the spill occurred.[2] Second, the truncated number of lost trips was added across respondents by month, and the typical number of trips was also added across respondents by month. The sum of typical trips represents an estimate of baseline trips in each month. Third, the total number of lost trips for all respondents was divided by the total number of typical trips for all respondents to estimate the percent decline in trips in a given month. Since the number of trips a respondent would have taken absent the spill may be greater than the typical number of trips a respondent takes, it is also possible for lost trips to exceed

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2. The factor 0.756 was calculated using daily estimates of shoreline recreation trips under baseline conditions in November 2007 to sites included in the onsite counts (see Appendix G). The daily trip estimates reflected visitation to sites included in the onsite counts and were estimated using the model developed from the onsite counts.

typical trips. Truncating the number of lost trips to be less than or equal to the number of typical trips may therefore be conservative.

Table J.1 shows lost trips as a percent of baseline trips for November 2007 through June 2008. Lost trips were 38.1% of baseline trips for the period November 7 to November 30, 2007. This percentage declined to 16.0% in December 2007 and to 9.4% in January 2008. For the damage assessment, the period of spill impacts was assumed to extend from November 2007 to June 2008. The estimate of lost trips as a percent of baseline trips was 2.0% in June 2008, and any spill impacts to recreation after June were not included in the assessed losses.

Table J.1. Lost trips as a percent of baseline trips for survey respondents

Month	Lost trips	Baseline trips	Lost trips as percent of baseline trips
November 7–30, 2007	544	1,425	38.1%
December 2007	277	1,735	16.0%
January 2008	154	1,637	9.4%
February 2008	122	1,780	6.8%
March 2008	89	2,079	4.3%
April 2008	79	2,702	2.9%
May 2008	66	2,169	3.1%
June 2008	44	2,184	2.0%

J.3.3   Total baseline trips

The total number of baseline trips to shoreline sites in the assessment area was estimated using onsite sampling that involved counts of recreation trips at selected shoreline sites. Estimating total trips using information from the onsite sampling accounted for trips taken by tourists and other people who may live in places outside the coverage area of the telephone survey. It also represented a conservative estimate of total shoreline trips because, unlike the telephone survey, the onsite sampling accounted for trips to a precisely circumscribed area around each shoreline site. If some shoreline trips are taken to areas near a particular site but outside the site boundaries delineated in the onsite sampling, results of the onsite sampling would provide an underestimate of total baseline trips.

The calculation of total baseline trips involved two steps. The first step was to develop an estimate of total baseline trips to the specific sites that were included in the onsite sampling. The number of baseline trips to these sites was estimated using onsite counts conducted during November 2008. A model was developed to account for the influence of weekdays and weekend days on recreation activity and to adjust for differences in weather between November 2008 and the months for which baseline predictions were developed. Specifically, baseline trips to the selected sites were estimated for the period November 2007 to June 2008. The details of this estimation procedure and the adjustments for weather are described in Appendix G.

The second step in calculating total baseline trips involved adjusting the estimated number of baseline trips at sites included in the onsite sampling to account for sites that were not part of the onsite sampling. This adjustment relied on information from the telephone survey. As described below, information from the telephone survey was used to estimate baseline trips taken by survey respondents to sites throughout the Bay Area. The baseline trip estimates derived from the telephone survey included trips over a three-month period to 110 sites, including 25 sites that were part of the onsite sampling and 85 sites that were not part of the onsite sampling. Using information from the telephone survey, a ratio was calculated comparing baseline trips taken by survey respondents to all 110 sites in the assessment area to baseline trips taken by survey respondents to the 25 sites included in the onsite sampling. This ratio was 1.4. Multiplying the total number of baseline trips estimated from the onsite sampling by 1.4 resulted in an estimate of total baseline trips to all sites in the assessment area. Table J.2 shows the estimated total number of baseline trips to assessment area sites by month. The estimate of total baseline trips varied from a low of 1,058,810 trips in January 2008 to a high of 1,502,575 trips in June 2008.

Table J.2. Total baseline trips and total lost trips

Month	Total baseline trips	Lost trips as percent of baseline trips	Total lost trips
November 7–30, 2007	1,158,645	38.1%	441,918
December 2007	1,258,557	16.0%	201,179
January 2008	1,058,810	9.4%	99,308
February 2008	1,120,151	6.8%	76,551
March 2008	1,292,753	4.3%	55,024
April 2008	1,260,231	2.9%	36,907
May 2008	1,422,526	3.1%	43,597
June 2008	1,502,575	2.0%	29,967

J.3.4   Total lost trips

The total number of lost trips was estimated by multiplying the total number of baseline trips throughout the assessment area by the estimate of lost trips as a percent of baseline trips. Table J.2 shows the result of this calculation by month. The total number of lost trips declines from 441,918 in November 2007 to 29,967 in June 2008.

J.4   The Value per Lost Trip

The value per lost trip was calculated using a travel-cost model. The model was developed from information collected in the telephone survey about the frequency and destination of shoreline recreation trips taken by survey respondents. A travel-cost model is used to estimate the value of recreation trips based on information about the distance people travel and the costs they incur to reach recreation sites. The use of travel-cost models for assessing impacts to recreation (Herriges and Kling, 1999; Phaneuf and Smith, 2005) and recreational losses from oil spills (Hausman et al., 1995; English et al., 2009) is well established. The model was developed to represent recreation choices of Bay Area residents under baseline conditions. The model was then adjusted to represent spill conditions using information from the telephone survey about the geographic extent of spill impacts to recreation and the number of lost recreation trips attributable to the spill.

The following elements of the travel cost model and the techniques for estimating the value of lost trips are described below: (1) development of data for estimating a baseline model of shoreline recreation, including the number of trips to sites in the Bay Area, the cost of traveling to shoreline sites, and demographic variables; (2) the model specification, including the development of a site-choice and participation model and the use of alternative-specific constants to represent the quality of shoreline sites; (3) calibration of the model to information about spill impacts to recreation, including the geographic extent of spill impacts and the number of lost trips; and (4) use of the model to estimate the value per lost trip.

J.4.1   Data for estimating a baseline model

The travel-cost model was developed using information about respondents' reported trips within the three months prior to the time of the interview. As noted earlier, the survey was administered between June 2008 and August 2008, and the trips reported by respondents occurred between April 2008 and August 2008. Respondents were asked to report the number of trips they had taken to Bay Area shoreline sites during the month when the interview was administered, up to the date of the interview. Respondents were also asked to report the number of trips they took to Bay Area shoreline sites in each of the two months prior to the month when the interview was

administered. Finally, respondents were asked to report the destination and other details of a representative selection of up to three of these trips.

For the purpose of developing the travel-cost model, the destinations of the selected trips were extrapolated to represent the destinations of all trips reported by each respondent. For example, a respondent might report specific information about two different trips in the months prior to the interview. The respondent might also report taking a total of six trips during the same period.[3] In this case the respondent was assumed to have taken three trips to each of the two destinations, for a total of six trips. The procedure was repeated for all respondents, and the results were used as the basis for a travel-cost model of trip destination and frequency. A model estimated in this way is unbiased, as long as the trips a respondent is asked to describe in detail do not systematically overrepresent certain shoreline destinations visited by the respondent. By adding baseline trips across individuals in the sample, this same procedure was also used to develop estimates of total baseline trips to each site in the assessment area.

The data required to develop a travel-cost model include travel distances between each respondent's place of residence and all shoreline sites included in the model. Distances were measured using PCMiler software. Distances were converted to travel cost using the sum of monetary expenses and time-related costs. Per-mile monetary expenses for driving were calculated as $0.21 per mile for gasoline and depreciation expenses divided by an average of 2.5 passengers per vehicle. The figure of $0.21 per mile was derived from a report of nationwide average driving costs for late 2007 published by the American Automobile Association. Per-mile time-related costs were calculated as family income divided by 2,000 hours per year, divided by 3 (for one-third hourly income), divided by 35 miles per hour. This approach to valuing the cost of time is common in the travel-cost literature (Train, 1998; Moeltner, 2003). Per-mile expenses for the cost of driving and the cost of time were multiplied by the round-trip driving distance from the resident's zip code to the shoreline site. The PCMiler program also provided information on tolls along each route, and these costs were added to per-mile costs to calculate the total cost of traveling to shoreline sites.

Respondents to a survey are often unwilling to report their income, and 40.0% of respondents to the shoreline recreation survey did not report their family income. A log-linear regression was used to impute incomes for those who did not provide this data so that income could be used in constructing the travel-cost variable as described above. For the 965 respondents who reported

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3. The number of trips a respondent reported for the month during which the interview took place represented the respondent's recreation activity for the portion of the month that had elapsed prior to the interview. To ensure that each respondent's recreation activity was represented equally, this amount was adjusted to estimate the expected number of trips the respondent would take during the entire month. Specifically, the number of trips reported for the month of the interview was increased to equal the number of trips reported for the previous entire month, whenever the latter number was greater.

their family income, the natural log of family income was regressed on a constant term and five independent variables, including age (18–29, 30–44, 45–64, 65+); education (less than 9th grade, 9th grade to 12th grade, high school diploma, some college, associate's degree, bachelor's degree, graduate/professional degree); whether the respondent was Hispanic (no, yes, don't know, refused); race (white, black/African American, American Indian, Asian, Pacific Islander, other); and language spoken at home (English, Spanish, Chinese, Tagalog, Japanese, Vietnamese, other, no response). Income was imputed for the remaining 347 observations by taking the inverse natural log of the product of the estimated coefficients and the relevant demographic variables.

The remaining data required for the travel cost model were demographic characteristics. These were binary variables defined as follows: age (45 years old or older); education (bachelor's degree or higher); race (white); language spoken at home (English only); gender (female); and whether there were children living in the household. In each case the variable was set equal to one if the respondent could affirmatively be identified as part of the relevant group and to zero in all other cases, including those who did not provide a response to the relevant question.

J.4.2   Model specification

The shoreline recreation model is a site-choice and participation model, meaning it is able to predict changes in both the destination and frequency of recreation trips. The site-choice component is important for assessing spill impacts to recreation because it allows for the possibility that recreators switch to alternative recreation sites when the sites they would have used are affected by the spill. The participation component is important for assessing spill impacts to recreation because it allows for the possibility that people engage in activities other than shoreline recreation in response to the spill. Models that do not explicitly allow for substitution to other sites and other activities could result in a higher estimate of losses because such models may not fully account for the ability of recreators to mitigate spill-related losses.

Survey respondents identified 110 shoreline sites in the Bay Area where they take recreation trips. These include sites they visited in recent months and also included sites where they went less often during the period of the spill. It is difficult to include 110 sites in a travel-cost model because of the large number of model parameters required. It is common in the travel-cost literature to combine nearby sites to form a smaller number of aggregate shoreline destinations (Parsons and Needelman, 1992). For the Bay Area shoreline recreation model, the 110 individual sites were combined into groups to form 31 aggregate sites. The 110 individual sites and the 31 aggregate sites are shown in Attachment 2. Figure J.2 shows the aggregate sites with appropriate labels and also shows the individual sites as points within each aggregate site. Each aggregate site is named for the largest individual site it contains.

Figure J.2. Aggregate recreation sites.

The model structure used in the Bay Area shoreline recreation model was first developed as the "repeated-logit" model described in Morey et al. (1993). The specific form used for the Bay Area shoreline recreation model is described in detail as the "nested-logit" model in English (2008). This form includes a random-utility logit model of site choice, nested within a second logit model of trip frequency. As in English (2008), the quality and characteristics of recreation sites are described using site-specific constants. A specification relying on site-specific constants reduces bias in valuation results (Murdock, 2006) and is frequently applied in oil spill assessments (Hausman et al., 1995; English et al., 2004). In addition to site-specific constants, the model includes a variable representing the cost of travel to recreation sites, variables used in the trip-frequency model including a constant and demographic characteristics (age, education, race, children, language, and gender, as defined above), and a scale parameter used in the nested-logit specification. The statistical weights corresponding to each respondent were incorporated into the model using a weighted likelihood function.

The coefficients of the model are shown in Table J.3. The parameter for travel cost is negative, indicating that, all else equal, people are less likely to choose sites with higher travel cost. The 31 aggregate sites are listed in geographic sequence starting in the north and ending in the south. Each of the 31 aggregate sites includes more than one individual site, and the name used for the aggregate site is generally the name of the largest individual site within the aggregate group. The site-specific constants reflect the characteristics of the sites within each aggregate group. The length of available shoreline is an important site characteristic, which may explain why Ocean Beach has the largest site-specific constant. In the trip frequency model, a positive sign indicates that an increase in a particular variable is associated with less frequent recreation trips. Those who are older than 45, are female, or have children are less likely to take recreation trips to shoreline sites in the Bay Area.

J.4.3   Calibrating the model to information about spill impacts on recreation

The model of baseline recreation trips described above was adjusted to represent conditions during the period of spill impact. The decline in trips to shoreline sites during the period of the spill was assumed to be attributable to a decline in the quality of shoreline sites. Since the quality of shoreline sites is represented in the travel-cost model using site-specific constants, the model can be calibrated to spill impacts on recreation using adjustments to the site constants. A comparison of the calibrated model to the baseline model can then be used to estimate the lost value associated with the decline in the quality of shoreline sites. For November 2007, the site constants were modified to reflect the impact of the spill and the reduced number of trips taken to shoreline sites based on information from the telephone survey. The calibration of the model to spill impacts took into account the specific number of trips lost at each shoreline site. For months after November 2007, adjustments to the calibrated model reflected the declining severity of impacts over time.

Table J.3. Model coefficients

Variable	Coefficient	Standard error	*t*-statistic
Travel cost	-0.13	0.00	-61.39
Site constants			
Dillon Beach	7.08	1.60	4.43
Tomales Beach	7.17	1.58	4.53
Limantour Beach	6.98	1.53	4.57
Bolinas Beach	6.22	1.50	4.15
Stinson Beach	7.25	1.49	4.86
Muir Beach	4.47	1.61	2.78
Rodeo Beach	3.81	1.57	2.43
Marin Headlands	3.64	1.59	2.29
Sausalito/Angel Island	3.43	1.56	2.21
San Rafael	3.63	1.51	2.40
Carquinez	0.00		
San Pablo	1.19	1.84	0.65
Keller Beach	4.26	1.50	2.84
Point Isabel	5.96	1.50	3.99
Berkeley Marina	5.28	1.50	3.52
Alameda State Beach	5.97	1.49	4.00
Coyote Point	4.28	1.54	2.78
Mission Bay	2.65	1.63	1.63
Piers 1–45	5.72	1.51	3.80
Aquatic Park	4.55	1.50	3.03
Marina Green	3.65	1.51	2.42
Crissy Field Beach	6.50	1.50	4.33
Baker Beach	5.82	1.50	3.87
China Beach	4.62	1.51	3.07
Lands End Beach	4.56	1.51	3.03
Ocean Beach	7.79	1.50	5.19
Fort Funston	5.40	1.50	3.59
Sharp Park Beach	5.00	1.50	3.33
Pacifica Beach	6.87	1.50	4.57
Half-Moon Bay	6.71	1.53	4.39
San Gregorio Beach	5.40	1.76	3.07

Table J.3. Model coefficients (cont.)

Variable	Coefficient	Standard error	*t*-statistic
Trip frequency model			
Constant	5.66	0.43	13.21
Age	0.16	0.02	9.61
Education	-0.38	0.02	-23.80
Race	-0.18	0.02	-10.20
Children	0.37	0.03	14.62
Language	-0.86	0.02	-36.49
Gender	0.28	0.02	15.90
Nesting scale parameter	3.42	0.12	28.97

Questions in the telephone survey asked respondents about the number of trips they would have taken to shoreline sites in the Bay Area in November 2007 but did not take because of the spill. As described above, these questions were used to determine the number of lost trips for each respondent. Questions in the survey also asked respondents to identify which sites they avoided or went to less often. These questions were used to estimate the number of lost trips specifically associated with each shoreline recreation site. This was accomplished by allocating the lost trips for each respondent to each of the sites the respondent avoided or went to less often. The allocation accounted for the probability of visiting each site under baseline conditions as estimated by the travel-cost model. For example, a respondent might report taking 10 fewer trips because of the spill and might identify two sites that he or she avoided or went to less often. Each site identified would correspond to one of the aggregate sites used in the travel-cost model. The travel-cost model might estimate the relative probability of visiting each of the two aggregate sites as 0.7 and 0.3, respectively. In this case the estimate of this respondent's lost trips for the two sites would be 7 and 3, respectively. By adding up the site-specific estimates of lost trips across respondents, an estimate of lost trips for each of the 31 aggregate sites was obtained.

The estimate of lost trips for each of the aggregate sites in the model in November 2007 was used to calibrate the model to spill conditions. In the calibrated model, the number of trips to a given site must be equal to the number of baseline trips for the site less the number of lost trips for the site. A search procedure was used to find the appropriate 31 site-specific constants for the calibrated model that would satisfy this requirement. Prior to calibration, five sites (Dillon Beach, San Rafael, Coyote Point, Half Moon Bay, and San Gregorio Beach) were reported to be affected by fewer than three respondents; these sites were assumed to be unaffected. This threshold for aggregate sites is slightly higher than the threshold for individual sites used above, because each aggregate site combines lost trips from several individual sites and the number of lost trips at aggregate sites is therefore expected to be higher than the number of lost trips at

individual sites. In the calibrated model, the most significant declines in recreation trips occurred at Stinson Beach, Ocean Beach, and Pacifica Beach. This was due, in part to, the severity of impacts to recreation at these sites and, in part, to the popularity of these beaches under baseline conditions.

The number of lost trips reported by survey respondents declined in each month after November 2007. This was assumed to be attributable to two factors. First, the number of sites affected by the spill may have declined over time. Second, the severity of recreational impacts at any given site may have declined over time. Both of these factors were accounted for in the calibration of the model to spill impacts in months after November.

The sites that continued to be affected by the spill in months after November 2007 were identified using information from survey respondents to develop an index of spill impacts. The first step was to sum up the estimated number of people who avoided a given site in a given month because of the spill. For months after November, questions in the survey did ask whether affected respondents continued to take fewer trips because of the spill but did not ask respondents to give specific information about which sites they avoided. It was therefore assumed that respondents who continued to be affected after November continued to avoid the same sites they had avoided in November. In other words, the first step in calculating the spill index for a given site was to sum up the total number of people who both avoided the site in November and who continued to take fewer trips in the relevant month because of the spill.

The estimated number of people who avoided each site in a given month was then normalized based on the typical level of use at each site. Specifically, the number of people who avoided a given site in each month was divided by the total number of trips taken to the site by survey respondents under baseline conditions. Normalizing the index by the typical number of trips to each site controlled for the fact that more popular sites were more likely to be identified as affected by survey respondents. Without normalizing in this way, popular sites could have had a high index indicating significant effects even if a small percentage of people who used the sites under baseline conditions reported avoiding the site during the spill.

To identify affected sites, the index of spill impacts for a given site in a given month was compared to a minimum threshold. Sites with an index exceeding the threshold were determined to be affected. The appropriate threshold was selected by comparing the index to actual recreation impacts in November, as determined above. Specifically, the threshold was set so that the set of affected sites as predicted by the index in November matched the set of sites where at least three people specifically indicated impacts had occurred. This threshold was then applied to all months after November. The spill impact index declined for most sites in most months, and the number of sites determined to be affected also declined. The sites designated as affected in

each month are shown in Figure J.3. The number of sites identified as affected declined from 23 sites in November to 18 sites in December, 15 in January, 12 in February, 4 in March, 3 in April, 3 in May, and 1 in June.

For those sites that continued to be affected in each month, the severity of impacts at the sites was reflected in the spill-calibrated model using adjustments to the site constants. The spill-calibrated model for months after November satisfied two constraints. First, the site constants were adjusted each month to correctly reflect the total number of lost trips in each month. Unlike in November, the model was calibrated to total lost trips rather than the number of lost trips at each site, because site-specific losses were not available in months after November. Second, the relative severity of recreation impacts across sites as determined above for November 2007 was retained. Specifically, if the reduction in the site constant for the calibrated model relative to the baseline model was twice as great for one site relative to another site in November 2007, then the reduction was twice as great in all subsequent months, as long as both sites continued to be affected.

J.4.4   Value per lost trip

The value per lost trip was calculated for each month from November 2007 to June 2008 using a comparison between the baseline shoreline recreation model and the spill-calibrated model for each month. The value per lost trip was calculated as the loss in value estimated by the model divided by the number of lost trips in each month for all survey respondents. The loss in value was determined using the standard nested-logit formula for a change in consumer surplus given in Train (2003). The change in consumer surplus was calculated using the change in value of the site-specific constants in the spill-calibrated model relative to the baseline model.

The per-trip values for November 2007 through June 2008 are given in Table J.4. The values decline from $22.65 in November 2007 to $8.90 in June 2008. The values generally decline each month due to the declining number of sites affected by the spill. A decline in the number of sites affected corresponds to a lower per-trip loss because people avoiding the affected sites have a greater selection of alternative sites to visit and are therefore better able to mitigate losses. In some cases, the per-trip value increases modestly despite a decline in the number of affected sites because the sites that remain affected may be of higher value on average than the sites affected in the previous month. Differences in the value of individual sites are captured in the travel-cost model by differences in the distance people travel to reach the sites.
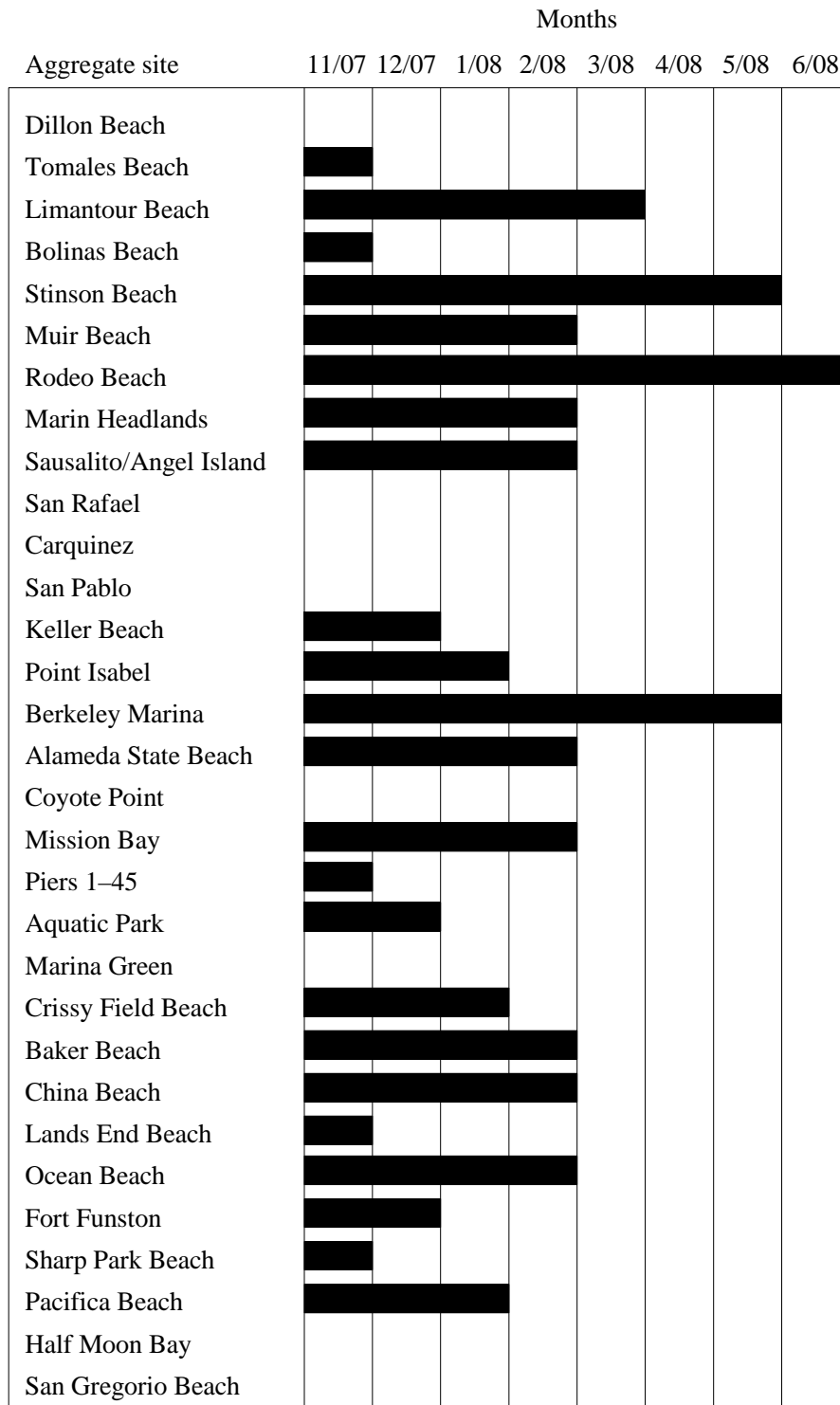
Figure J.3. Sites with impacted recreation visits by month.

Table J.4. Value per lost trip in 2007 dollars

Month	Value per lost trip
November 2007	$22.65
December 2007	$19.15
January 2008	$17.64
February 2008	$12.44
March 2008	$8.35
April 2008	$8.28
May 2008	$8.28
June 2008	$8.90

J.5   Summary of the Overall Damage Estimate

Table J.5 summarizes the result of the calculations described above. Amounts for baseline trips and lost trips and the value per lost trips are as reported above. Multiplying lost trips by the value per trip in each month results in a monthly estimate of losses. In 2007 dollars, total lost value declines from $10.0 million in November 2007 to $266,748 in June 2008. The total estimate of damages for the period from November 2007 to June 2008 is $18.0 million in 2007 dollars. To calculate the present value of shoreline recreation damages in January 2010, these amounts are adjusted for inflation using the monthly Consumer Price Index and adjusted for discounting using an annual 3% discount rate. As shown in the final column of Table J.5, the present value of damages in January 2010 was $20.2 million.

Table J.5. Summary of baseline trips, lost trips, and total damages

Month	Baseline trips	Lost trips as percent of baseline trips	Lost trips	Value per lost trip in November 2007 dollars	Lost value in November 2007 dollars	Present value of losses in January 2010
November 7–30, 2007	1,158,645	38.1	441,918	$22.65	$10,011,456	$11,351,008
December 2007	1,258,557	16.0	201,179	$19.15	$3,853,255	$4,343,775
January 2008	1,058,810	9.4	99,308	$17.64	$1,751,323	$1,962,069
February 2008	1,120,151	6.8	76,551	$12.44	$952,528	$1,062,133
March 2008	1,292,753	4.3	55,024	$8.35	$459,721	$509,348
April 2008	1,260,231	2.9	36,907	$8.28	$305,729	$337,010
May 2008	1,422,526	3.1	43,597	$8.28	$360,887	$394,656
June 2008	1,502,575	2.0	29,967	$8.90	$266,748	$288,322
Total	10,074,248		984,451		$17,961,646	$20,248,321

References

English, E. 2008. Recreation nonparticipation as choice behavior rather than statistical outcome. *American Journal of Agricultural Economics* 90(1):186–196. DOI: 10.1111/j.1467-8276.2007.01040.x.

English, E., C.H. Peterson, and C.M. Voss. 2009. Ecology and Economics of Compensatory Restoration. August. Available: http://www.crrc.unh.edu/research/crrc_english_book.pdf. Accessed October 17, 2010.

English, E., E. Duncan, R. Dunford, J. Siikamaki, and P. Wendt. 2004. Ever Reach Oil Spill Lost Recreational Use Valuation Report. Prepared for the Ever Reach Trustee Council. March.

Hausman, J.A., G.K. Leonard, and D. McFadden. 1995. A utility-consistent, combined discrete choice and count data model: Assessing recreational use losses due to natural resource damage. *Journal of Public Economics* 56:1–30.

Herriges, J.A. and C.L. Kling (eds.). 1999. *Valuing Recreation and the Environment: Revealed Preference Methods in Theory and Practice*. Edward Elgar, Northampton, MA. ISBN 1 — 85898-646.

Kish, L. 1992. Weighting for unequal P_i. *Journal of Official Statistics* 8(2):183–200.

Moeltner, K. 2003. Addressing aggregation bias in zonal recreation models. *Journal of Environmental Economics and Management* 45:128–144.

Morey, E.R., R.D. Rowe, and M. Watson. 1993. A repeated nested-logit model of Atlantic salmon fishing. *American Journal of Agricultural Economics* 75(3):578–592.

Murdock, J. 2006. Handling unobserved site characteristics in random utility models of recreation demand. *Journal of Environmental Economics and Management* 51:1–25.

Parsons, G.R. and M.S. Needelman. 1992. Site aggregation in a random utility model of recreation. *Land Economics* 68(4):418–433.

Phaneuf, D.J. and V.K. Smith. 2005. Recreation demand models. In *Handbook of Environmental Economics*, K. Mäler and J.R. Vincent (eds.). Elsevier, The Netherlands.

Train, K.E. 1998. Recreation demand models with taste differences over people. *Land Economics* 74(2):230–239.

Train, K. 2003. *Discrete Choice Methods with Simulation*. Cambridge University Press, Cambridge, UK.

Attachment 1. Shoreline Recreation Survey

SHORELINE USE TELEPHONE SURVEY

CATI instructions
INTERVIEWER INSTRUCTIONS
[Script insertions]

Hello, my name is **[name]** and I am calling on behalf of the city of San Francisco. We are conducting a survey about public lands and recreation in the San Francisco Bay Area. The survey will help the city and other government officials manage beaches more effectively. The survey is anonymous, and takes about 10 minutes. May I begin?

IF ENGLISH DOES NOT APPEAR TO BE PRIMARY LANGUAGE:

Q0: Do you prefer to do the survey in English, or another language?
1   English) *Continue, below*

2   Spanish)
3   Mandarin)
4   Cantonese)
5   Tagalog)
              For any of these languages:
              Please hold while I transfer you to another interviewer
              OR
              We will try to contact you again later. Thank you for your time.

6   Other) *terminate*

              Terminate: Sorry for the interruption. Thank you for your time.

L1: Your telephone number was randomly selected. In order to ensure our survey is representative, we need to interview the person 16 years or older living there who most recently had a birthday. Are you the person 16 years or older who most recently had a birthday?
1   Yes) *Go to Q1*
2   No

              L1A: May I speak with that person?
              1   Yes) *Go to L1B*
              2   No) IF RESPONDENT IS NOT AVAILABLE OR IT IS NOT A
                       GOOD TIME FOR AN INTERVIEW, SET UP A CALL BACK
                       (terminate)

L1B: (WHEN PERSON ANSWERS)

Hello, my name is **[name]** and I am calling on behalf of the city of San Francisco. We are conducting a survey about beaches in the San Francisco Bay Area. It will help the city and other government officials manage beaches more effectively. In order to ensure our survey is representative, we have asked to speak with you since you were picked randomly. The survey is anonymous, and takes about 10 minutes. May I begin?

1   Yes) *Repeat Q0, then Go to Q1*
2   No) *terminate*

Terminate: Thank you for your time.
L1C: OBSERVE AND RECORD RESPONDENT'S GENDER
1   Male
2   Female
3   Don't know

Q1: This survey concerns beaches in the San Francisco Bay area. This includes any beaches or waterfront areas on San Francisco Bay or the Pacific Ocean that you might go to for a trip lasting a single day or less. During the past twelve months, since July 2007, have you taken any single-day trips to a beach or waterfront in this area for activities like swimming, fishing, boating, kayaking, wildlife viewing, sunbathing, shellfishing, or picnicking, or exercising?

    1   Yes
    2   No) *Go to Q22*
    3   (DO NOT READ) Don't know) *Go to Q22*

Q2: Since May 1 of this year, have you gone to a beach or waterfront area in the San Francisco Bay area for recreational activities like swimming, fishing, boating, kayaking, wildlife viewing, sunbathing, shellfishing, or picnicking, or exercising?

    1   Yes
    2   No) *Go to Q6*

Q2A: During the month of May, did you go to a beach or waterfront area in the San Francisco Bay Area for recreation?

    1   Yes
    2   No) *Go to Q2B*

Q2A2. How many times? **[May trips] Note to interviewer: use list to help clarify question if respondent seems to want clarification**

    1   Once
    2   Twice
    3   Three
    4   Four
    5   Five or six times

6   About once a week
7   About twice a week
8   About three times a week
9   About four times a week
10   About five times a week
11   Almost every day
12   Every day

Q2B: In June of this year, did you go to a beach or waterfront area in the San Francisco Bay Area for recreation?
1   Yes
2   No) *Go to Q2C*

Q2B2. How many times? **[June trips] Note to interviewer: use list to help clarify question if respondent seems to want clarification**
1   No times
2   Once
3   Twice
4   Three
5   Four
6   Five or six times
7   About once a week
8   About twice a week
9   About three times a week
10   About four times a week
11   About five times a week
12   Almost every day
13   Every day

Q2C: Since July 1, have you gone to a beach or waterfront area in the San Francisco Bay Area for recreation?
1   Yes
2   No) *Go to trip log*

Q2C2. How many times? **[July trips] Note to interviewer: use list to help clarify question if respondent seems to want clarification**
1   No times
2   Once
3   Twice
4   Three
5   Four
6   Five or six times
7   About once a week
8   About twice a week
9   About three times a week
10   About four times a week

> **11**   About five times a week
> **12**   Almost every day
> **13**   Every day

(Begin trip log)

Log 1: If trips since May 1 < = 3 (Else go to Log 2)

> Q3: What was the date of your most recent trip to a beach or waterfront area in the San Francisco Bay Area? (IF NECESSARY: "We know it can be hard to remember dates. Please do your best.") **(NOTE TO TAI – WE CAN ACCEPT A RANGE FOR THIS)**
>   _____ Date
>
> Q3A: What beach or waterfront area did you go to on that trip? IDENTIFY SITE FROM LIST PROVIDED. IF NOT ON LIST, ENTER MANUALLY. IF RESPONDENT DOES NOT KNOW THE NAME OF THE BEACH, ASK FOR NEAREST TOWN OR LANDMARK. **– Note to interviewer, ask open-ended and clarify that nearest landmark is okay if respondent can't remember name.**
> > **1**   Ocean Beach
> > **2**   Baker Beach
> > **3**   Etc.
>
> Q3B: What activity did you do on this trip? (IF MORE THAN ONE ACTIVITY, IDENTIFY PRIMARY ACTIVITY ONLY) **– Note to interviewer: Ask open ended but offer suggestions for clarification if needed**
> > **1**   Swimming
> > **2**   Fishing
> > **3**   Boating
> > **4**   Kayaking
> > **5**   Wildlife viewing
> > **6**   Sunbathing
> > **7**   Shellfishing
> > **8**   Picnicking
> > **9**   Exercising
> > **10**   Other _____
>
> Q3C: Did you travel by car?
> > **1**   Yes
> > **2**   No) *Go to Q4*
>
> Q3D: How many people, including yourself, rode in the car?
>   _____number of people
>
> *If trips since May 1 = 2 or 3: (Else go to Q6)*

Q4: What was the date of your 2nd most recent trip to a beach or waterfront area in the San Francisco Bay Area? (**NOTE TO TAI – WE CAN ACCEPT A RANGE FOR THIS**)

_____ Date

Q4A: What beach or waterfront area did you go to on that trip? IDENTIFY SITE FROM LIST PROVIDED. IF NOT ON LIST, ENTER MANUALLY. – **Note to interviewer, ask open-ended and clarify that nearest landmark is okay if respondent can't remember name.**

  1 Ocean Beach
  2 Baker Beach
  3 Etc.

Q4B: What activity did you do on this trip? (IF MORE THAN ONE ACTIVITY, IDENTIFY PRIMARY ACTIVITY ONLY) – **Note to interviewer: Ask open ended but offer suggestions for clarification if needed**

  1 Swimming
  2 Fishing
  3 Boating
  4 Kayaking
  5 Wildlife viewing
  6 Sunbathing
  7 Shellfishing
  8 Picnicking
  9 Exercising
 Other _____

Q4C: Did you travel by car?
  1 Yes
  2 No) *Go to Q5*

Q4D: How many people, including yourself, rode in the car?
_____number of people

 If trips since May 1 = 3: (Else go to Q6)

  Q5: What was the date of your 3rd most recent trip to a beach or waterfront area in the San Francisco Bay Area? (**NOTE TO TAI – WE CAN ACCEPT A RANGE FOR THIS)**

  _____ Date

Q5A: What beach or waterfront area did you go to on that trip? IDENTIFY SITE FROM LIST PROVIDED. IF NOT ON LIST, ENTER MANUALLY. **– Note to interviewer, ask open-ended and clarify that nearest landmark is okay if respondent can't remember name.**

     1   Ocean Beach
     2   Baker Beach
     3   Etc.

Q5B: What activity did you do on this trip? (IF MORE THAN ONE ACTIVITY, IDENTIFY PRIMARY ACTIVITY ONLY) **– Note to interviewer: Ask open ended but offer suggestions for clarification if needed**

     1   Swimming
     2   Fishing
     3   Boating
     4   Kayaking
     5   Wildlife viewing
     6   Sunbathing
     7   Shellfishing
     8   Picnicking
     9   Exercising
     10   Other _____

Q5C: Did you travel by car?

     1   Yes
     2   No) *Go to Q6*

Q5D: How many people, including yourself, rode in the car?
_____number of people

Go to Q6

Log 2: If May trips ≥1 and June trips ≥1 and July trips ≥1 (Else go to Log 3)

Q3-2: You said you took **[May trips]** trips to beaches or waterfront areas in the San Francisco Bay Area in May. What was the date of your (IF MORE THAN ONE: last) trip in May? (**NOTE TO TAI – WE CAN ACCEPT A RANGE FOR THIS**)

     _____ Date

Q3A-2: What beach or waterfront area did you go to on that trip? IDENTIFY SITE FROM LIST PROVIDED. IF NOT ON LIST, ENTER MANUALLY. **– Note to interviewer, ask open-ended and clarify that nearest landmark is okay if respondent can't remember name.**

 1 Ocean Beach
 2 Baker Beach
 3 Etc.

Q3B-2: What activity did you do on this trip? (IF MORE THAN ONE ACTIVITY, IDENTIFY PRIMARY ACTIVITY ONLY) **– Note to interviewer: Ask open ended but offer suggestions for clarification if needed**

 1 Swimming
 2 Fishing
 3 Boating
 4 Kayaking
 5 Wildlife viewing
 6 Sunbathing
 7 Shellfishing
 8 Picnicking
 9 Exercising
 10 Other _____

Q3C-2: Did you travel by car?

 1 Yes
 2 No) *Go to Q4-2*

Q3D-2: How many people, including yourself, rode in the car?
_____number of people

Q4-2: You said you took **[June trips]** trips to beaches or waterfront areas in the San Francisco Bay Area in June. What was the date of your (IF MORE THAN ONE: last) trip in June? (**NOTE TO TAI – WE CAN ACCEPT A RANGE FOR THIS**)

 _____ Date

Q4A-2: What beach or waterfront area did you go to on that trip? IDENTIFY SITE FROM LIST PROVIDED. IF NOT ON LIST, ENTER MANUALLY. **– Note to interviewer, ask open-ended and clarify that nearest landmark is okay if respondent can't remember name.**

 1 Ocean Beach
 2 Baker Beach
 3 Etc.

Q4B-2: What activity did you do on this trip? (IF MORE THAN ONE ACTIVITY, IDENTIFY PRIMARY ACTIVITY ONLY) – **Note to interviewer: Ask open ended but offer suggestions for clarification if needed**

      1   Swimming
      2   Fishing
      3   Boating
      4   Kayaking
      5   Wildlife viewing
      6   Sunbathing
      7   Shellfishing
      8   Picnicking
      9   Exercising
      10   Other _____

Q4C-2: Did you travel by car?
      1   Yes
      2   No) *Go to Q5-2*

Q4D-2: How many people, including yourself, rode in the car?
_____number of people

Q5-2: You said you took **[July trips]** trips to beaches or waterfront areas in the San Francisco Bay Area in July. What was the date of your (IF MORE THAN ONE: last) trip in July? (**NOTE TO TAI – WE CAN ACCEPT A RANGE FOR THIS)**

      _____ Date

    Q5A-2: What beach or waterfront area did you go to on that trip? IDENTIFY SITE FROM LIST PROVIDED. IF NOT ON LIST, ENTER MANUALLY. **– Note to interviewer, ask open-ended and clarify that nearest landmark is okay if respondent can't remember name.**

        1   Ocean Beach
        2   Baker Beach
        3   Etc.

Q5B-2: What activity did you do on this trip? (IF MORE THAN ONE ACTIVITY, IDENTIFY PRIMARY ACTIVITY ONLY) **– Note to interviewer: Ask open ended but offer suggestions for clarification if needed**

      1   Swimming
      2   Fishing
      3   Boating
      4   Kayaking
      5   Wildlife viewing
      6   Sunbathing
      7   Shellfishing
      8   Picnicking

9 Exercising
10 Other _____

Q5C-2: Did you travel by car?
1 Yes
2 No) *Go to Q6*

Q5D-2: How many people, including yourself, rode in the car?
_____number of people

Go to Q6

Log 3: If May trips = 0 and June trips ≥ 2 and July trips ≥ 1 (Else go to Log 4)

Q3-3: You said you took **[June trips]** trips to beaches or waterfront areas in the San Francisco Bay Area in June. What was the date of your first trip in June?
(NOTE TO TAI – WE CAN ACCEPT A RANGE FOR THIS)
_____ Date

Q3A-3: What beach or waterfront area did you go to on that trip?
IDENTIFY SITE FROM LIST PROVIDED. IF NOT ON LIST, ENTER MANUALLY. – **Note to interviewer, ask open-ended and clarify that nearest landmark is okay if respondent can't remember name.**
1 Ocean Beach
2 Baker Beach
3 Etc.

Q3B-3: What activity did you do on this trip? (IF MORE THAN ONE ACTIVITY, IDENTIFY PRIMARY ACTIVITY ONLY) – **Note to interviewer: Ask open ended but offer suggestions for clarification if needed**
1 Swimming
2 Fishing
3 Boating
4 Kayaking
5 Wildlife viewing
6 Sunbathing
7 Shellfishing
8 Picnicking
9 Exercising
10 Other _____

Q3C-3: Did you travel by car?
1 Yes
2 No) *Go to Q4-3*

Q3D-3: How many people, including yourself, rode in the car?
_____number of people

Q4-3: What was the date of your last trip in June? **(NOTE TO TAI – WE CAN ACCEPT A RANGE FOR THIS)**
_____ Date

> Q4A-3: What beach or waterfront area did you go to on that trip? IDENTIFY SITE FROM LIST PROVIDED. IF NOT ON LIST, ENTER MANUALLY. **– Note to interviewer, ask open-ended and clarify that nearest landmark is okay if respondent can't remember name.**
> **1**   Ocean Beach
> **2**   Baker Beach
> **3**   Etc.

Q4B-3: What activity did you do on this trip? (IF MORE THAN ONE ACTIVITY, IDENTIFY PRIMARY ACTIVITY ONLY) **– Note to interviewer: Ask open ended but offer suggestions for clarification if needed**
1   Swimming
2   Fishing
3   Boating
4   Kayaking
5   Wildlife viewing
6   Sunbathing
7   Shellfishing
8   Picnicking
9   Exercising
10 Other _____

Q4C-3: Did you travel by car?
   1   Yes
   2   No) *Go to Q5-3*

Q4D-3: How many people, including yourself, rode in the car?
_____number of people

Q5-3: What was the date of your most recent trip in July? **(NOTE TO TAI – WE CAN ACCEPT A RANGE FOR THIS)**
_____ Date

Q5A-3: What beach or waterfront area did you go to on that trip?
IDENTIFY SITE FROM LIST PROVIDED. IF NOT ON LIST, ENTER
MANUALLY. **– Note to interviewer, ask open-ended and clarify that
nearest landmark is okay if respondent can't remember name.**
  1   Ocean Beach
  2   Baker Beach
  3   Etc.

Q5B-3: What activity did you do on this trip? (IF MORE THAN ONE
ACTIVITY, IDENTIFY PRIMARY ACTIVITY ONLY) **– Note to interviewer:
Ask open ended but offer suggestions for clarification if needed**
  1   Swimming
  2   Fishing
  3   Boating
  4   Kayaking
  5   Wildlife viewing
  6   Sunbathing
  7   Shellfishing
  8   Picnicking
  9   Exercising
  10   Other _____

Q5C-3: Did you travel by car?
  1   Yes
  2   No) *Go to Q6*

Q5D-3: How many people, including yourself, rode in the car?
_____number of people

   Go to Q6

Log 4. If May trips = 0 and June trips = 1 and July trips ≥ 2 (Else go to Log 5)

Q3-4: For the trip you took in June, what was the date of your trip? (**NOTE TO
TAI – WE CAN ACCEPT A RANGE FOR THIS**)
  _____ Date

Q3A-4: What beach or waterfront area did you go to on that trip?
IDENTIFY SITE FROM LIST PROVIDED. IF NOT ON LIST, ENTER
MANUALLY. **– Note to interviewer, ask open-ended and clarify that
nearest landmark is okay if respondent can't remember name.**
  1   Ocean Beach
  2   Baker Beach
  3   Etc.

Q3B-4: What activity did you do on this trip? (IF MORE THAN ONE ACTIVITY, IDENTIFY PRIMARY ACTIVITY ONLY) **– Note to interviewer: Ask open ended but offer suggestions for clarification if needed**

     1   Swimming
     2   Fishing
     3   Boating
     4   Kayaking
     5   Wildlife viewing
     6   Sunbathing
     7   Shellfishing
     8   Picnicking
     9   Exercising
     10   Other _____

Q3C-4: Did you travel by car?
     1   Yes
     2   No) *Go to Q4-4*

Q3D-4: How many people, including yourself, rode in the car?
_____number of people

Q4-4: You said you took **[July trips]** trips to beaches or waterfront areas in the San Francisco Bay Area in July. What was the date of your first trip in July? **(NOTE TO TAI – WE CAN ACCEPT A RANGE FOR THIS)**
     _____ Date

     Q4A-4: What beach or waterfront area did you go to on that trip? IDENTIFY SITE FROM LIST PROVIDED. IF NOT ON LIST, ENTER MANUALLY. **– Note to interviewer, ask open-ended and clarify that nearest landmark is okay if respondent can't remember name.**
          1   Ocean Beach
          2   Baker Beach
          3   Etc.

Q4B-4: What activity did you do on this trip? (IF MORE THAN ONE ACTIVITY, IDENTIFY PRIMARY ACTIVITY ONLY) **– Note to interviewer: Ask open ended but offer suggestions for clarification if needed**
     1   Swimming
     2   Fishing
     3   Boating
     4   Kayaking
     5   Wildlife viewing
     6   Sunbathing
     7   Shellfishing
     8   Picnicking

      9   Exercising
      10   Other _____

Q4C-4: Did you travel by car?
      1   Yes
      2   No) *Go to Q5-4*

Q4D-4: How many people, including yourself, rode in the car?
_____number of people

Q5-4: What was the date of your most recent trip in July? **(NOTE TO TAI – WE CAN ACCEPT A RANGE FOR THIS)**
      _____ Date

    Q5A-4: What beach or waterfront area did you go to on that trip?
    IDENTIFY SITE FROM LIST PROVIDED. IF NOT ON LIST, ENTER
    MANUALLY. **– Note to interviewer, ask open-ended and clarify that
    nearest landmark is okay if respondent can't remember name.**
          1   Ocean Beach
          2   Baker Beach
          3   Etc.

Q5B-4: What activity did you do on this trip? (IF MORE THAN ONE
ACTIVITY, IDENTIFY PRIMARY ACTIVITY ONLY) **– Note to interviewer:
Ask open ended but offer suggestions for clarification if needed**
          1   Swimming
          2   Fishing
          3   Boating
          4   Kayaking
          5   Wildlife viewing
          6   Sunbathing
          7   Shellfishing
          8   Picnicking
          9   Exercising
          10   Other _____

Q5C-4: Did you travel by car?
      1   Yes
      2   No) *Go to Q6*

Q5D-4: How many people, including yourself, rode in the car?
_____number of people

     Go to Q6

Log 5. Otherwise

Q3-5: What was the date of your most recent trip to a beach or waterfront area in the San Francisco Bay Area? (**NOTE TO TAI – WE CAN ACCEPT A RANGE FOR THIS)**
_____ Date

Q3A-5: What beach or waterfront area did you go to on that trip? IDENTIFY SITE FROM LIST PROVIDED. IF NOT ON LIST, ENTER MANUALLY. **– Note to interviewer, ask open-ended and clarify that nearest landmark is okay if respondent can't remember name.**
   1   Ocean Beach
   2   Baker Beach
   3   Etc.

Q3B-5: What activity did you do on this trip? (IF MORE THAN ONE ACTIVITY, IDENTIFY PRIMARY ACTIVITY ONLY) **– Note to interviewer: Ask open ended but offer suggestions for clarification if needed**
   1   Swimming
   2   Fishing
   3   Boating
   4   Kayaking
   5   Wildlife viewing
   6   Sunbathing
   7   Shellfishing
   8   Picnicking
   9   Exercising
   10   Other _____

Q3C-5: Did you travel by car?
   1   Yes
   2   No) *Go to Q4-5*

Q3D-5: How many people, including yourself, rode in the car?
_____number of people

Q4-5: What was the date of your 2nd most recent trip to a beach or waterfront area in the San Francisco Bay Area? (**NOTE TO TAI – WE CAN ACCEPT A RANGE FOR THIS)**
_____ Date

Q4A-5: What beach or waterfront area did you go to on that trip? IDENTIFY SITE FROM LIST PROVIDED. IF NOT ON LIST, ENTER MANUALLY. **– Note to interviewer, ask open-ended and clarify that nearest landmark is okay if respondent can't remember name.**
   1   Ocean Beach
   2   Baker Beach
   3   Etc.

Q4B-5: What activity did you do on this trip? (IF MORE THAN ONE ACTIVITY, IDENTIFY PRIMARY ACTIVITY ONLY) – **Note to interviewer: Ask open ended but offer suggestions for clarification if needed**

       1   Swimming
       2   Fishing
       3   Boating
       4   Kayaking
       5   Wildlife viewing
       6   Sunbathing
       7   Shellfishing
       8   Picnicking
       9   Exercising
      10   Other _____

Q4C-5: Did you travel by car?
       1   Yes
       2   No) *Go to Q5-5*

Q4D-5: How many people, including yourself, rode in the car?
_____number of people

Q5-5: What was the date of your 3rd most recent trip to a beach or waterfront area in the San Francisco Bay Area? **(NOTE TO TAI – WE CAN ACCEPT A RANGE FOR THIS)**
_____ Date

Q5A-5: What beach or waterfront area did you go to on that trip? IDENTIFY SITE FROM LIST PROVIDED. IF NOT ON LIST, ENTER MANUALLY. – **Note to interviewer, ask open-ended and clarify that nearest landmark is okay if respondent can't remember name.**
       1   Ocean Beach
       2   Baker Beach
       3   Etc.

Q5B-5: What activity did you do on this trip? (IF MORE THAN ONE ACTIVITY, IDENTIFY PRIMARY ACTIVITY ONLY) – **Note to interviewer: Ask open ended but offer suggestions for clarification if needed**
       1   Swimming
       2   Fishing
       3   Boating
       4   Kayaking
       5   Wildlife viewing
       6   Sunbathing
       7   Shellfishing
       8   Picnicking

> **9** Exercising
> **10** Other _____

Q5C-5: Did you travel by car?
> **1** Yes
> **2** No) *Go to Q6*

Q5D-5: How many people, including yourself, rode in the car?
_____number of people

(End trip log)

We are interested in how often you typically go to the beach during the course of the year. We are only interested in trips lasting one day or less, not in overnight trips. We are not interested in the details your visits, only in what you typically do.

Q6: Do you typically go to beach or waterfront areas for single-day trips in August?
> **1** Yes
> **2** No) *Go to Q7*

> Q6A: How often? **Note to interviewer: use list to help clarify question if respondent seems to want clarification**
> > **1** Once
> > **2** Twice
> > **3** Three
> > **4** Four
> > **5** Five or six times
> > **6** About once a week
> > **7** About twice a week
> > **8** About three times a week
> > **9** About four times a week
> > **10** About five times a week
> > **11** Almost every day
> > **12** Every day

Q7: Do you say you typically go to the beach or waterfront areas for single-day trips in September?
> **1** Yes
> **2** No) *Go to Q8*

> Q7A: How often? **Note to interviewer: use list to help clarify question if respondent seems to want clarification**
> > **1** Once
> > **2** Twice
> > **3** Three
> > **4** Four

    5   Five or six times
    6   About once a week
    7   About twice a week
    8   About three times a week
    9   About four times a week
    10   About five times a week
    11   Almost every day
    12   Every day

Q8: Do you typically go to the beach or waterfront areas for single-day trips in October?
    1   Yes
    2   No) *Go to Q9*

    Q8A: How often? **Note to interviewer: use list to help clarify question if respondent seems to want clarification**
    1   Once
    2   Twice
    3   Three
    4   Four
    5   Five or six times
    6   About once a week
    7   About twice a week
    8   About three times a week
    9   About four times a week
    10   About five times a week
    11   Almost every day
    12   Every day

Q9: Do you typically go to the beach or waterfront areas for single-day trips in November?
    1   Yes
    2   No) *Go to Q10*

    Q9A: How often? **Note to interviewer: use list to help clarify question if respondent seems to want clarification**
    1   Once
    2   Twice
    3   Three
    4   Four
    5   Five or six times
    6   About once a week
    7   About twice a week
    8   About three times a week
    9   About four times a week
    10   About five times a week

11 Almost every day
12 Every day

Q10: Do you typically go to the beach or waterfront areas for single-day trips in December?
    1 Yes
    2 No) *Go to Q11*

    Q10A: How often? **Note to interviewer: use list to help clarify question if respondent seems to want clarification**
    1 Once
    2 Twice
    3 Three
    4 Four
    5 Five or six times
    6 About once a week
    7 About twice a week
    8 About three times a week
    9 About four times a week
    10 About five times a week
    11 Almost every day
    12 Every day

Q11: Do you typically go to the beach or waterfront areas for single-day trips in January?
    1 Yes
    2 No) *Go to Q12*

    Q11A: How often? **Note to interviewer: use list to help clarify question if respondent seems to want clarification**
    1 Once
    2 Twice
    3 Three
    4 Four
    5 Five or six times
    6 About once a week
    7 About twice a week
    8 About three times a week
    9 About four times a week
    10 About five times a week
    11 Almost every day
    12 Every day

Q12: Do you typically go to the beach or waterfront areas for single-day trips in February?
    1 Yes
    2 No) *Go to Q13*

Q12A: How often? **Note to interviewer: use list to help clarify question if respondent seems to want clarification**
- **1** Once
- **2** Twice
- **3** Three
- **4** Four
- **5** Five or six times
- **6** About once a week
- **7** About twice a week
- **8** About three times a week
- **9** About four times a week
- **10** About five times a week
- **11** Almost every day
- **12** Every day

Q13: Do you typically go to the beach or waterfront areas for single-day trips in March?
- **1** Yes
- **2** No) *Go to Q14 test*

Q13A: How often? **Note to interviewer: use list to help clarify question if respondent seems to want clarification**
- **1** Once
- **2** Twice
- **3** Three
- **4** Four
- **5** Five or six times
- **6** About once a week
- **7** About twice a week
- **8** About three times a week
- **9** About four times a week
- **10** About five times a week
- **11** Almost every day
- **12** Every day

If (November trips (Q10) > 0 OR December trips (Q11) > 0) AND IF (May trips (Q2A) > 0 OR June trips (Q2B) > 0), ask Q14 (else go to Q15)

Q14: Do you typically go the same sites during November and December as you did during May and June?
- **1** Yes
- **2** No

Q15: Do recall whether anything prevented you from going to beaches or waterfront areas in the San Francisco Bay Area as much as you would have liked, or where you would have liked, during last November? Ask open ended – **DO NOT READ LIST.**

> **1** No, nothing
> **2** Weather
> **3** No time (including work, family obligations)
> **4** Cost-related reason/Too expensive
> **5** Oil Spill) *Go to Q17*
> **6** No one to go with
> **7** Age/health
> **8** Don't know
> **9** Other (specify):

Q16: As you may know, there was an oil spill in San Francisco Bay that occurred November 7 of last year. Were you aware of the spill before now?

> **1** Yes
> **2** No) *Go to Q22*
> **3** (DO NOT READ): Don't know) *Go to Q22*

Q17: Did the oil spill stop you from going to certain beach or waterfront areas that you would normally have visited in the San Francisco Bay area during last November?

> **1** Yes
> **2** No) *Go to Q18*
> **3** (DO NOT READ) Don't know) *Go to Q18*

Q17A: Which beach or waterfront areas did you stop going to? IDENTIFY SITES FROM LIST PROVIDED. IF NOT ON LIST, ENTER MANUALLY. ENTER MULTIPLE SITES. **– Note to interviewer, ask open-ended and clarify that nearest landmark is okay if respondent can't remember name.**

> **1** Ocean Beach
> **2** Baker Beach
> **3** Etc.

Q17B: How many times would you say you normally would have gone to sites affected by the spill in November, but didn't because of the spill? **– Note to interviewer – Range okay. Encouragement such as "Give you best estimate" is okay.**

> _____times **[stopped going]**

Q17C: When you stopped going to certain places because of the spill, did you sometimes go to other beaches or waterfront areas instead?

> **1** Yes
> **2** No) *Go to Q21*

Q17D: What other beach or waterfront areas did you go to instead? IDENTIFY SITES FROM LIST PROVIDED. IF NOT ON LIST, ENTER MANUALLY. ENTER MULTIPLE SITES. **– Note to interviewer, ask open-ended and clarify that nearest landmark is okay if respondent can't remember name.**

     1   Ocean Beach
     2   Baker Beach
     3   Etc.

Q17E: Of the **[stopped going]** times you avoided sites affected by the spill, how many times would you say you went to these other places instead?
_____times ***Go to Q21***

(If answer to Q17 is no)

Q18: Did you go less often than you normally would to certain beach or waterfront areas in the San Francisco Bay area last November because of the oil spill?

     1   Yes
     2   No) ***Go to Q19***
     3   (DO NOT READ) Don't know) ***Go to Q19***

Q18A: Which beach or waterfront areas did you go to less often because of the spill? IDENTIFY SITES FROM LIST PROVIDED. IF NOT ON LIST, ENTER MANUALLY. ENTER MULTIPLE SITES. **– Note to interviewer, ask open-ended and clarify that nearest landmark is okay if respondent can't remember name.**

     1   Ocean Beach
     2   Baker Beach
     3   Etc.

Q18B: How many fewer times than normal would you say you went to these sites last November because of the spill?
_____fewer times **[fewer times]**

Q18C: When you went to certain places less often because of the spill, did you sometimes go to other beaches or waterfront areas instead?

     1   Yes
     2   No) ***Go to Q21***

Q18D: What other beach or waterfront areas did you go to instead?
IDENTIFY SITES FROM LIST PROVIDED. IF NOT ON LIST, ENTER
MANUALLY. ENTER MULTIPLE SITES. – **Note to interviewer, ask
open-ended and clarify that nearest landmark is okay if respondent
can't remember name.**
      1   Ocean Beach
      2   Baker Beach
      3   Etc.

Q18E: Of the **[fewer times]** times you avoided sites affected by the spill,
how many times would you say you went to these other places instead?
_____times *Go to Q21*

(If NO to both Q17 and Q18)

Q19: So following the spill last November you still went to the same beach and
waterfront areas, as often as you normally would at that time of year?
      1   Yes) *Go to Q20*
      2   No

      Q19A: Did you stop going to certain sites, or just go less often?
            1   Stop going to certain sites) *Go to Q17A*
            2   Go less often) *Go to Q18A*

Q20: Did the spill affect your trips last November in any other way? – **Ask open-ended –
DO NOT READ LIST.**
      1   No, no effect
      2   Reduced enjoyment
      3   Lower catch rates
      4   Other_____(specify):

      Go to Q22

Q21: Have your trips to beach and waterfront areas in the San Francisco Bay Area gotten
back to normal, or are the effects you just described to me still going on?
      1   Back to normal
      2   Still going on) *Go to Q21B*

      Q21A: In what month were your trips to beaches and waterfront areas in the San
      Francisco Bay Area back to normal?
            1   December 2007
            2   January 2008
            3   February 2008
            4   March 2008
            5   April 2008

> **6**   May 2008
> **7**   June 2008

> *If Q17 = Yes do Q21B, else go to Q21C and check "if" statement*

> Q21B: *For each month prior to the time specified in Q21A, or through July if Q21 = 2:* How many times would you say you normally would have gone to sites affected by the spill in [**month**], but didn't because of the spill?
> _____ times (*go to Q22*)

> *If Q18 = Yes do Q21C, else go to Q22*

> Q21C: *For each month prior to the time specified in Q21A, or through July if Q21 = 2*: How many fewer times than normal would you say you went to sites affected by the spill in [**month**]?

Q22:

> *If skipped from Q1:* Even though you didn't take any trips to the beach in the last 12 months, it is important that we include everybody in our results. For statistical purposes, we'd like to ask you a few questions about yourself and your household.

> > May I ask your age?
> > _____years

> *Otherwise:* We're just about through. The final few questions are for background information and help us analyze the results.

> > May I ask your age?
> > _____years

Q23: How many people live in your household, including yourself?
_____number of people

Q24: How many children under the age of 16 live with you in your household?
_____number of children

Q25: How many family members, related to you by birth, marriage or adoption, live with you in your household?
_____number of family members

Q26: How many different land-line telephone numbers do you have in your household?
_____number of land-lines

Q27: What is your zip code?

Q28: What is the highest degree or level of school you have completed?
    1   No schooling completed
    2   Nursery to 4th grade
    3   5th or 6th grade
    4   7th or 8th grade
    5   9th grade
    6   10th grade
    7   11th grade
    8   12th grade, no diploma
    9   High school diploma
    10   Some college, no degree
    11   Associate degree
    12   Bachelor's degree
    13   Masters degree
    14   Professional school degree
    15   Doctoral degree

Q29: Are you Spanish, Hispanic, or Latino?
    1   Yes
    2   No
    3   Don't know
    4   Refused

Q30: What race do you consider yourself to be?
    1   White
    2   Black or African American
    3   American Indian or Alaska Native
    4   Asian
    5   Native Hawaiian or other Pacific Islander
    6   Other_(specify):_____

Q31: Do you speak a language other than English at home?
    1   Yes
    2   No – only English) *Go to Q32*

Q31A: What is this language?
    1   English
    2   Spanish
    3   Chinese
    4   Tagalog
    5   Japanese
    6   Vietnamese
    7   Other

Q32: My next question is about your family income. This includes wages, salaries, interest and other income for you and all family members living with you. During 2007, what was your total family income before taxes?

$_____ family income

IF REFUSE:

Q32A: Could I place your income in a general category? Was your family income
1 Less than $25,000
2 Between $25,000 and $50,000
3 Between $50,000 and $75,000
4 Between $75,000 and $100,000
5 Greater than $100,000

Q33: That completes the survey. Thank you very much for your time. If you have any additional comments, I can record them here. (MANUALLY ENTER ANY COMMENTS) **– note to interview, record open-ended response**

_____comments

Q34: OBSERVE AND RECORD RESPONDENT'S GENDER.
1 Male
2 Female
3 Don't know

Attachment 2. Shoreline Recreation Sites

Table 2.1. Shoreline recreation sites

Individual site name	County	Included in onsite sampling	Aggregate site name
Bodega Bay/Point	Sonoma		
Doran Beach	Sonoma		Dillon Beach
Dillon Beach	Marin		
Tomales Beach	Marin		
Kehoe Beach	Marin		
Hearts Desire Beach	Marin		Tomales Beach
Pebble Beach	Marin		
Outer Schooner Bay	Marin		
Drakes Beach	Marin		
Limantour Beach	Marin		
Santa Maria Beach	Marin		Limantour Beach
Sculptured Beach	Marin		
Point Reyes/Arch Rock	Marin		
Palomarin Beach	Marin		
RCA Beach	Marin		
Agate Beach	Marin		Bolinas Beach
Bolinas Beach	Marin		
Stinson Beach	Marin	Yes	
Bolinas Ridge	Marin		Stinson Beach
Muir Beach	Marin	Yes	
Tennessee Valley	Marin	Yes	Muir Beach
Rodeo Beach	Marin	Yes	
Fort Cronkhite	Marin		Rodeo Beach
Marin Headlands	Marin		
Point Bonita Lighthouse	Marin		
Black Sands Beach	Marin		
Headlands	Marin		Marin Headlands
Kirby Cove	Marin		
Fort Baker	Marin		

Table 2.1. Shoreline recreation sites (cont.)

Individual site name	County	Included in onsite sampling	Aggregate site name
Angel Island State Park	Marin		
Beaches near Sausalito	Marin		Beaches near Sausalito (including Angel Island)
Mill Valley Waterfront	Marin		
Tiburon Area	Marin		
San Rafael (Canal and Bay Area)	Marin		
McNear's Beach County Park	Marin		San Rafael (Canal and Bay Area)
China Camp Beach	Marin		
Carquinez (East Bay)	Contra Costa		Carquinez
Martinez Marina	Contra Costa		
Pinole Area	Contra Costa	Yes	San Pablo
San Pablo	Contra Costa		
Point Richmond/Cliffside	Contra Costa		
Keller Beach	Contra Costa	Yes	Keller Beach
Miller/Knox Shoreline	Contra Costa	Yes	
Ferry Point	Contra Costa	Yes	
Rosie Riveter Park	Contra Costa	Yes	
Richmond Area/Marina	Contra Costa		
Eastshore State Park	Contra Costa	Yes	Point Isabel Regional Shoreline
Point Isabel Regional Shoreline	Contra Costa	Yes	
Berkeley Bulb	Alameda	Yes	
Albany Beach	Alameda	Yes	
North Basin	Alameda		
Cesar Chavez Park	Alameda		
Berkeley Marina	Alameda		Berkeley Marina
Emeryville Marina	Alameda		
Treasure Island	San Francisco		
Jack London Square	Alameda		Alameda Memorial State Beach (Robert Crown Memorial State Beach)
Crab Cove	Alameda	Yes	
Robert Crown/Alameda Memorial State Beach	Alameda	Yes	
Hayward Marsh	Alameda		

Table 2.1. Shoreline recreation sites (cont.)

Individual site name	County	Included in onsite sampling	Aggregate site name
Coyote Point	San Mateo		
Oyster Point	San Mateo		Coyote Point
Brisbane Marina	San Mateo		
Candlestick Point	San Francisco		
Mission Bay	San Francisco	Yes	
AT&T Park/South Beach Harbor/Marina Area	San Francisco		Mission Bay
Pier 38	San Francisco		
Farmer's Market/Ferry Building	San Francisco		
Pier 1	San Francisco		
Pier 3	San Francisco		
Embarcadero	San Francisco		
Pier 9	San Francisco		
Pier 15	San Francisco		
Pier 23	San Francisco		Piers 1–45
Pier 27	San Francisco		
Pier 31	San Francisco		
Pier 33	San Francisco		
Pier 39/Fisherman's Wharf	San Francisco		
Pier 41	San Francisco		
Pier 45	San Francisco		
Aquatic Park/Ghirardelli Square	San Francisco	Yes	
Alcatraz Island	San Francisco		Aquatic Park/
San Francisco Municipal Pier	San Francisco	Yes	Municipal Pier
Fort Mason	San Francisco		
Marina Green	San Francisco		
Beach on Scott Street in San Francisco	San Francisco		Marina Green
Presidio Beach/Area	San Francisco		
Crissy Field Beach (East Beach)	San Francisco	Yes	Crissy Field Beach
Fort Point	San Francisco	Yes	

Table 2.1. Shoreline recreation sites (cont.)

Individual site name	County	Included in onsite sampling	Aggregate site name
Golden Gate Bridge (Beach)	San Francisco		
Baker Beach	San Francisco	Yes	Baker Beach
Battery Chamberlain	San Francisco	Yes	
China Beach	San Francisco	Yes	China Beach
Mile Rock Beach	San Francisco		Lands End Beach
Lands End Beach	San Francisco		
Cliff House and Sutro Baths	San Francisco		
Sutro Historic District (Sutro Heights)	San Francisco		Ocean Beach
Ocean Beach	San Francisco	Yes	
Fort Funston	San Francisco	Yes	Fort Funston
Esplanade Beach	San Mateo		
Sharp Park Beach	San Mateo		Sharp Park Beach
Mori Point	San Mateo		
Rockaway Beach	San Mateo		
Linda Mar Beach	San Mateo		Pacifica Beach
Pacifica Beach	San Mateo		
Gray Whale Cove	San Mateo		
Montara Beach	San Mateo		
Moss Beach	San Mateo		Half-Moon Bay
Half-Moon Bay	San Mateo		
San Gregorio Beach	San Mateo		San Gregorio Beach
Pescadero Beach	San Mateo		