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Recreational Shoreline Use Damages Due to the Refugio Beach Oil Spill

September 14, 2018

prepared for:

Refugio Beach Oil Spill Natural Resource Damage Assessment

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CHAPTER 1 | INTRODUCTION

On May 19, 2015 an underground pipeline ruptured just west of Refugio State Beach in Santa Barbara County, California, spilling over 120,000 gallons of crude oil into the soil and onto the ground (hereafter referred to as "the spill").[1] A significant portion of the oil flowed down a nearby ravine and into the Pacific Ocean. After reaching the ocean, the oil spread primarily southward and eastward. Oil washed up on shore around Refugio and El Capitan State Beaches (Exhibit 1.1). In the weeks following the spill, oil and/or tarballs washed ashore in numerous locations along the coastlines of Santa Barbara, Ventura, and Los Angeles Counties.

EXHIBIT 1.1. OVERVIEW OF ASSESSMENT AREA

[1] The United States Department of Transportation's failure investigation for the spill indicates that, according to the pipeline owner, 2,934 barrels, or 123,228 gallons of oil were released (USDOT, 2016).

The spill occurred within the undeveloped portion of Santa Barbara County referred to as the "Gaviota Coast." The Gaviota Coast is widely recognized for its scenic beauty and outdoor recreation opportunities, and the area supports California State Park's mission of supporting health, inspiration, and education through the preservation of extraordinary biological diversity, protecting valued natural and cultural resources, and creating opportunities for high-quality outdoor recreation. In fact, in the early 2000s, the National Park Service (NPS) undertook a feasibility study to determine if the Gaviota Coast should be added to the National Park System (NPS, 2003).

Federal and state natural resource trustee agencies ("Trustees"), in coordination with Plains All America Pipeline (the pipeline owner and operator), conducted a Natural Resource Damage Assessment (NRDA) to assess the impacts of the spill on natural resources. The Trustees for the natural resources injured by the spill include the United States Department of Commerce represented by the National Oceanic and Atmospheric Administration; the United States Department of the Interior represented by the United States Fish and Wildlife Service (USFWS) and the Bureau of Land Management (BLM); the California Department of Fish and Wildlife; the California Department of Parks and Recreation; the California State Lands Commission; and the Regents of the University of California.

As part of the NRDA, the Trustees assessed the impacts of the spill on recreational users of the coastal and marine environment. Recreational users were potentially impacted due to the direct oiling of natural resources and the reasonable expectation of oiling, shoreline and fishing closures, advisories, and cleanup activities. This report documents the impact of the spill on recreational shoreline use, including activities such as sunbathing, strolling, exercising, wildlife viewing, swimming, surfing, shore-based fishing, and nonmotorized boating (e.g., canoeing, kayaking, stand-up paddle boarding) originating from beaches or other informal boating access points.[2]

Economic losses to shoreline users are based on the economic concept of consumer surplus (USDOI, 1987). An individual's consumer surplus from a shoreline trip represents the difference between (1) the maximum amount that the individual would be willing to pay for the trip and (2) the amount that the individual actually paid for the trip (in gasoline, supplies, etc.). Thus, consumer surplus is a measure of the net value of a trip, after all expenses have been paid. Shoreline damages estimated in this report are measured as the aggregate decline in value across all impacted individuals.

We estimated shoreline damages in Santa Barbara and Ventura Counties in four steps:

1) Estimate the number of lost shoreline days;
2) Estimate the economic value per lost shoreline day;
3) Multiply the number of lost days by the value per lost day; and

[2] The boating and offshore use assessment (Horsch et al., 2018) includes impacts to nonmotorized boating originating from boat launches and marinas.

4) Adjust losses to present value.

We used a conceptually similar approach for Los Angeles County, but an existing recreation model simplified the process and allowed us to estimate shoreline damages directly. Specifically, the quantification of lost shoreline days and the associated lost economic value are calculated within the model, and the output is simply lost value.

Chapter 2 provides a description of shoreline use opportunities in the assessment area and summarizes the spill impacts on these opportunities. Chapter 3 describes our quantification of lost shoreline days in Santa Barbara and Ventura Counties. Chapter 4 consists of three sections. The first section describes our method for estimating the value per lost shoreline day in Santa Barbara and Ventura Counties. The second section presents our approach for estimating losses in Los Angeles County. The final section of Chapter 4 summarizes our total damages estimate.

CHAPTER 2 | OVERVIEW OF SPILL IMPACTS TO SHORELINE USE

This chapter provides an overview of recreational shoreline use opportunities in Santa Barbara, Ventura, and Los Angeles Counties. It then describes how shoreline use in these areas may have been impacted by the spill.

2.1 SHORELINE USE RESOURCES IN ASSESSMENT AREA

The stretch of coastline from Point Conception in Santa Barbara County to Long Beach in Los Angeles County provides numerous recreation opportunities at sandy beaches and other coastal access points. Much of this coastline is accessible to the public in the form of city, county, and state parks, and via other informal access points. Collectively, the beaches in these areas receive millions of annual visits (Chen et al., 2015).

Exhibit 2.1 displays several shoreline use locations in Santa Barbara County. From north to south along the Gaviota Coast, formal access exists at Gaviota State Park, Refugio State Beach, and El Capitan State Beach. Numerous "pocket beaches" along Highway 101 can be accessed by trails leading down from roadside pulloffs. Around the University of California-Santa Barbara (UCSB) in Isla Vista, access points include Haskell's Beach, Sands Beach, Devereux Beach, and Campus Point Beach. The Goleta area includes Goleta Beach and Arroyo Burro Beach County Parks. The Santa Barbara waterfront includes Leadbetter, West, and East Beaches. East of the Santa Barbara waterfront are several small beaches and Carpinteria State Beach.

EXHIBIT 2.1. SELECTED SHORELINE USE LOCATIONS IN SANTA BARBARA COUNTY

Exhibits 2.2 and 2.3 display several shoreline use locations in Ventura and Los Angeles Counties. Hobson Beach and Faria Beach Parks are located in northwestern Ventura County. The coast along Ventura and Oxnard has numerous access points, including Emma Wood State Beach, San Buenaventura State Beach, Hollywood Beach, Silver Strand Beach, and Port Hueneme Beach Park. Point Mugu State Park is located in southern Ventura County. The Malibu coastline in Los Angeles County includes Leo Carillo State Park, Zuma Beach, Point Dume State Beach, Malibu Lagoon State Beach, Topanga Beach, and other sites. The coastline of south Santa Monica Bay is nearly one continuous stretch of beach, and includes Santa Monica State Beach, Dockweiler State Beach, Manhattan Beach, Hermosa Beach, and Redondo Beach. Finally, Long Beach is located in southeastern Los Angeles County.

EXHIBIT 2.2. SELECTED SHORELINE USE LOCATIONS IN VENTURA COUNTY

EXHIBIT 2.3. SELECTED SHORELINE USE LOCATIONS IN LOS ANGELES COUNTY

2.2 SPILL IMPACTS TO SHORELINE USE

In Santa Barbara County, several beaches were temporarily closed as a result of the spill, including Refugio State Beach, El Capitan State Beach, three pocket beaches (Tajiguas,

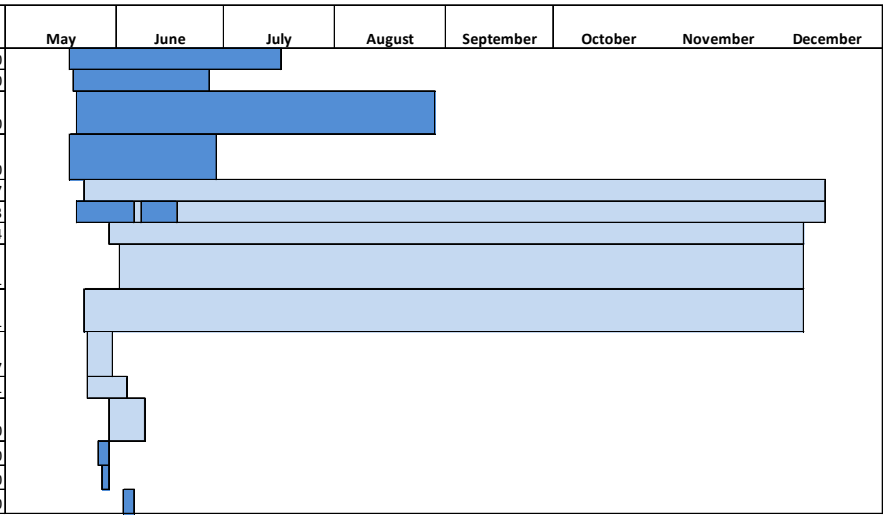
Venadito, and Las Flores Beaches), and Sands Beach. Refugio State Beach, located immediately east of the release point, was evacuated on May 19, 2015 and remained closed for 59 days, reopening on July 17, 2015 (Exhibits 2.4 and 2.5). El Capitan State Beach was evacuated on May 20 and remained closed for 37 days, reopening on June 26. The three pocket beaches were closed for 100 days from May 21 to August 28. Sands Beach, located in Isla Vista near UCSB was closed for 26 days from May 21 to June 5 and from June 8 to 17. In addition, a fisheries closure was established on May 19 for the immediately affected area around the release point (Exhibit 2.6). On May 21, the fisheries closure area was expanded to include the shoreline between Canada de Alegeria and Coal Oil Point, as well as all ocean waters within six miles of this shoreline. The fisheries closure remained in place through June 28.

Advisory signs instructing people to avoid contact with tar and oil were posted at numerous locations in Santa Barbara and Ventura Counties. These advisories were posted as early as May 23 and removed as late as December 15, depending on the location. Near Isla Vista and Goleta, advisories were present for about 200 days. Along the Santa Barbara waterfront, advisories were posted for as long as 11 days, starting on May 24. In Ventura County, advisories were posted on large, electronic highway signs along major coastal access routes throughout the county from May 30 to June 8.

In Los Angeles County, four beaches were briefly closed seaward of the lifeguard towers (including the water). Manhattan Beach was closed over three days (May 27 to 29), nearby Hermosa and Redondo Beaches were closed over two days (May 28 to 29), and Long Beach was closed over three days (June 3 to 5).

EXHIBIT 2.4. SHORELINE USE-RELATED CLOSURES AND ADVISORIES

Site	Closure Days	Advisory Days
Refugio State Beach	59	0
El Capitan State Beach	37	0
Tajiguas, Venadito, and Las Flores Beaches	100	0
Ocean Fishing in Vicinity of Release Point[a]	41	0
Haskell's Beach	0	207
Sands Beach	26	183
Devereux Beach	0	194
Isla Vista (excluding Campus Point Beaches)	0	191
Goleta Beach and Arroyo Burro Beach County Parks	0	201
Leadbetter and West Beaches	0	7
East Beach	0	11
Beaches and campgrounds in Ventura County	0	10
Manhattan Beach[b]	3	0
Hermosa and Redondo Beaches[b]	2	0
Long Beach[c]	3	0



Notes:

[a] – The fisheries closure only included the area near the release point between May 19 and 20 (Exhibit 2.6). Between May 21 and June 28, it was expanded to include the area up to six miles offshore from Canada de Alegeria (western boundary) to Coal Oil Point (eastern boundary).

[b] – Manhattan Beach was closed the afternoon of May 27. Hermosa and Redondo Beaches were added to the closure area on May 28, and all three beaches were closed through the evening of May 29.

c – Closure in place from late evening on June 3 to early morning on June 5. Closure included area between 1st Place and 72nd Place.

EXHIBIT 2.5. LOCATIONS OF ADVISORIES AND CLOSURES

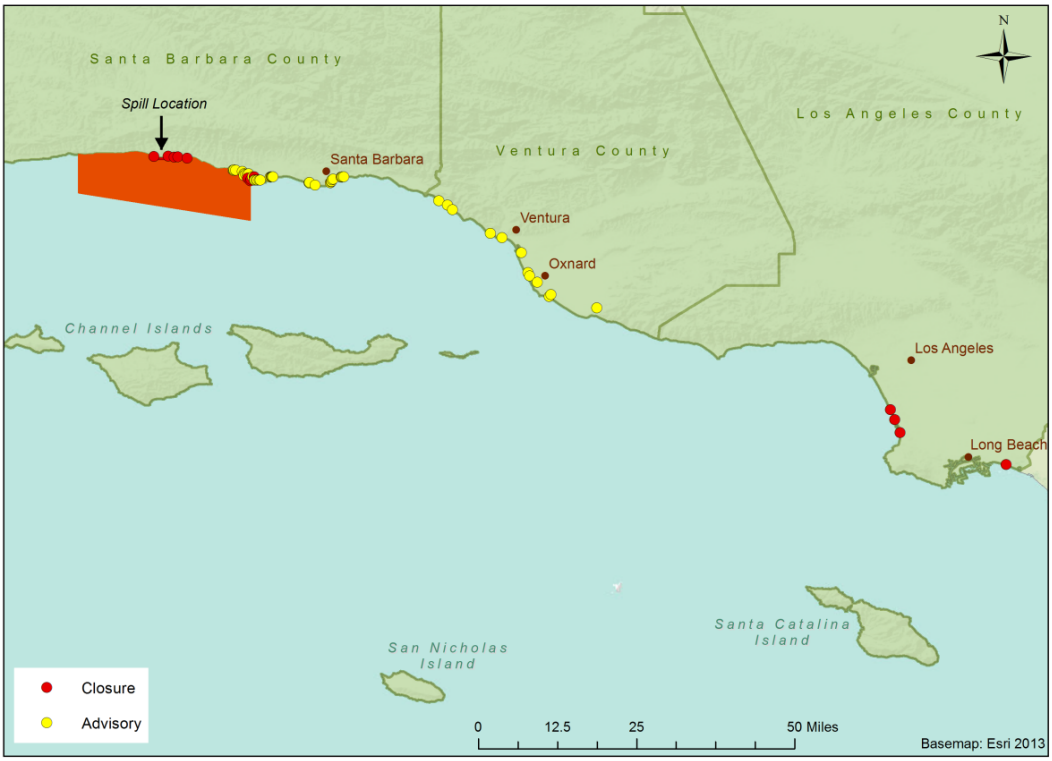
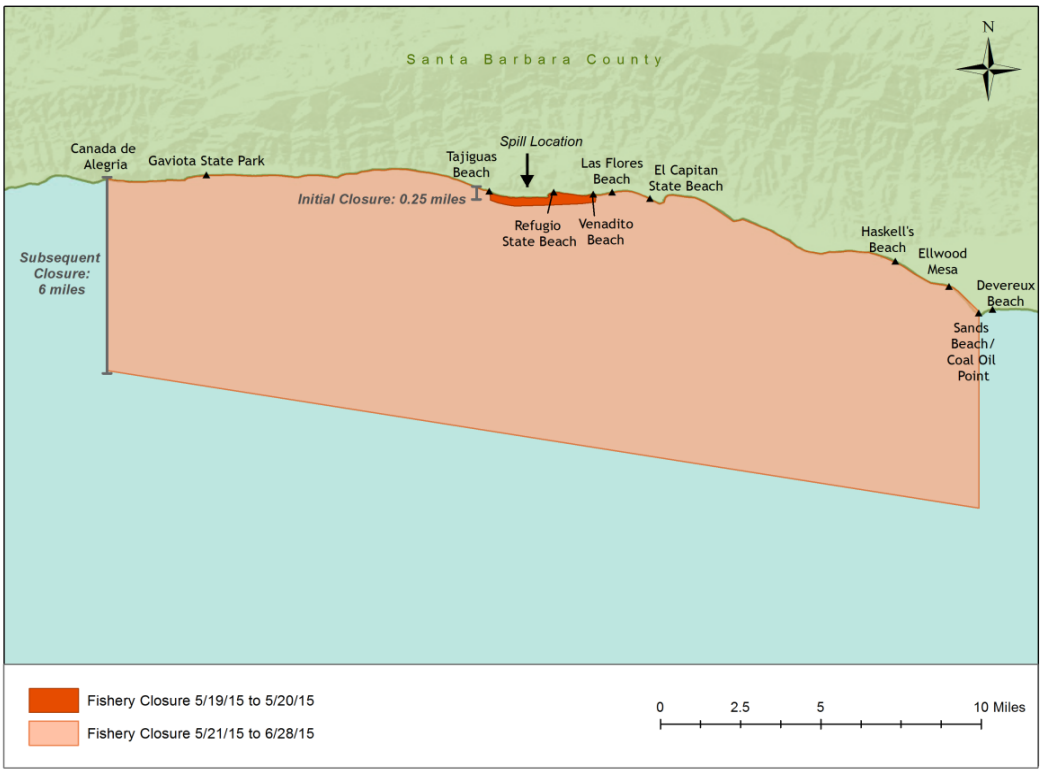


EXHIBIT 2.6. FISHERIES CLOSURE AREA



In addition to these advisories and closures, incident-related cleanup crews were present on several beaches in the weeks following the spill, ranging from Gaviota State Beach in the north to Long Beach in the south. Oiling was heaviest and persisted longest in areas close to the release point (i.e., in the vicinity of Refugio and El Capitan State Beaches) and downcoast to Coal Oil Point. The oil spread primarily south and east from the release point, though some spread west to Gaviota State Park. Light to moderate oiling was observed at coastal locations throughout the rest of Santa Barbara County and much of Ventura County. Oil and tarballs also washed ashore at some locations in Los Angeles County. During the weeks after the spill, media coverage of the event was pronounced throughout the South Coast region, and to a lesser extent nationally, on television, social media, and in newspapers.

CHAPTER 3 | NUMBER OF LOST SHORELINE RECREATION DAYS IN SANTA BARBARA AND VENTURA COUNTIES

This chapter describes the quantification of lost shoreline days in Santa Barbara and Ventura Counties. We begin with an overview of the available data and the methods, and then describe how these methods are implemented. The final section summarizes our estimate of lost shoreline days.

3.1 OVERVIEW OF DATA AND ANALYSIS APPROACH

The number of lost shoreline days equals the reduction in shoreline use relative to baseline, or the conditions that would have existed had the spill not occurred. We calculated lost days for each site in three steps:

1) Calculate the percentage reduction in use;
2) Estimate baseline use; and
3) Multiply the percentage reduction in use by baseline use.

PERCENTAGE REDUCTION IN USE

For a subset of coastal sites in Santa Barbara and Ventura Counties, we have daily data over multiple months on site attendance, vehicle traffic, or parking fees for 2015 and at least one other year. These sources constitute the best available information for quantifying the percentage reduction in use due to the spill, and are described in the following bullets.

- **State Parks Day Use Data**: The California Department of Parks and Recreation tracks the number of day use vehicles (separate from camping) entering each state park in the assessment area on a daily basis. We obtained data for 2010-2015 for most parks.
- **UCSB Coal Oil Point Reserve Spot Counts**: The Coal Oil Point Reserve at UCSB conducts spot counts of beach and water users at Sands Beach. A spot count (or "instantaneous count") provides a snapshot of the number of visitors at a specific time of day. For example, a spot count conducted at 3:30 pm might take a few minutes and result in a count of 15 users. Data are collected nearly every day, and several counts are usually conducted on each data collection day. We obtained data for 2010-2015.
- **County of Santa Barbara Vehicle Counter Data**: The County of Santa Barbara used automated counters to track daily vehicle traffic at Goleta Beach and Arroyo Burro Beach County Parks during the summer in 2015 and 2016.

- **Santa Barbara City Parking Data**: The City of Santa Barbara collects parking fees for coastal lots using a mixture of parking attendants and self-pay machines. We obtained daily data on the number of vehicles that paid for parking at lots along the Santa Barbara waterfront from 2010-2015. The lots include Leadbetter Lot, Palm Park Lot, and Cabrillo East and West Lots.[3]

Using these data, we constructed site-specific models of visitation as a function of weather, day of week, holidays, month, and other factors (Section 3.2). The models were used to predict visitation in 2015 at each site as if the spill had not occurred. Predicted visitation was compared to actual use to estimate the percentage reduction in use.

For a few sites around Coal Oil Point, we have limited data for a short period after the spill in 2015 and for the same time period in 2016. Specifically, the Trustees conducted spot counts multiple times per day in late May and early June in 2015 and 2016 at Haskell's Beach, Sands Beach, Devereux Beach, and Campus Point Beach. Using these data, we estimate the percentage reduction in use by comparing estimates of total use across years (Section 3.3).[4]

We do not have reliable data for estimating changes in visitation at other sites in Santa Barbara and Ventura Counties. Therefore, we estimate the percentage reduction in use for these sites by extrapolating results from surrounding areas (Section 3.3).

BASELINE USE

For all sites, we rely on visitation data collected outside of the spill period to develop estimates of baseline use. We estimate baseline for Refugio and El Capitan State Beaches, the three adjacent pocket beaches, and Goleta and Arroyo Burro Beach County Parks using the data sources described above combined with supplemental visitation data collected by the Trustees in early June 2016 (Section 3.4). Specifically, supplemental visitation data were collected at Tajiguas Beach, Venadito Beach, Las Flores Beach, El Capitan State Beach (walk-in day use only), Goleta Beach County Park, and Arroyo Burro Beach County Park.[5] Together, these data allow us to develop comprehensive estimates of baseline use at each of these sites.

For other sites, the data used to estimate the percentage reduction in use cannot also be used to develop comprehensive estimates of baseline use. For example, parking sales data from Santa Barbara Waterfront only provide a partial picture of baseline visitation because they exclude walk-in use. Instead, we estimate baseline visitation using information from an offsite survey conducted by the South Coast Marine Protected Areas

[3] The locations of these lots can be found on the City of Santa Barbara's website: http://www.santabarbaraca.gov/gov/depts/waterfront/parking/parking_lots.asp.

[4] The primary source of information for estimating percentage reduction in use at Sands Beach is the daily data model based on the UCSB Coal Oil Point Reserve spot counts (Section 3.2). However, we considered the Trustee spot counts in our analysis (Section 3.3).

[5] Data were also collected at Santa Barbara City coastal parking lots in early June 2016, however, these data were used to characterize the type of visitation (recreational vs. non-recreational) rather than to estimate total baseline use.

(MPA) Baseline Program (Section 3.4). The South Coast MPA Baseline Program used a general-population online survey in 2012-2013 of Southern California residents to estimate the amount and types of visitation at locations throughout the South Coast region (i.e., from Point Conception in Santa Barbara County to the California/Mexico border; Chen et al., 2015). This work was part of a long term effort to understand visitation trends in and around MPAs along the South Coast. This data source is referred to as "the MPA Baseline survey" elsewhere in this chapter.

3.2 PERCENTAGE REDUCTION IN USE FOR SITES WITH DAILY DATA MODELS

This section describes the site-specific models used to estimate the percentage reduction in use at Gaviota State Park, Refugio and El Capitan State Beaches, Sands Beach (including Coal Oil Point), Goleta and Arroyo Burro Beach County Parks, Santa Barbara Waterfront (Leadbetter Beach, West Beach, and East Beach), Carpinteria State Beach, San Buenaventura State Beach, and Point Mugu State Park (see Exhibits 2.1 and 2.2).[6] We first describe model development and then present the results.

METHOD

As discussed in Section 3.1, we compiled daily data for several sites on attendance, parking sales, or vehicle traffic for 2015 and at least one other year. These data were used to estimate site-specific models of daily visitation in non-spill years (Exhibit 3.1). The models are then used to predict visitation in 2015 at each site as if the spill had not occurred. We compared predicted and actual visitation in 2015 to estimate the percentage reduction in use for these sites.

EXHIBIT 3.1. VISITATION DATA USED TO ESTIMATE DAILY DATA MODELS

SITE	VISITATION DATA USED TO ESTIMATE MODEL
State Parks	Day use data from May to September 2010-2014[a,b]
Sands Beach (including Coal Oil Point)	Spot counts of beach users from May to July 2010-2014
Goleta and Arroyo Burro Beach County Parks	Vehicle traffic counts from late May to late July 2016
Santa Barbara Waterfront Beaches	Parking fee data from May to September 2010-2014[c]

Notes:
[a] – Day use data are collected at the main lot and pier lot at San Buenaventura State Beach. Data from the main lot have not been collected consistently over time due to differences in how special events are handled, and were therefore excluded from our analysis. We were unable to obtain data for the pier lot prior to June 2011. Pre-spill data from May 2015 are included in the San Buenaventura pier lot model as described later in this section.
[b] – For Point Mugu State Park, we were unable to obtain data for August and September of 2010 and September of 2011-2014.
[c] – For Palm Park Lot, pre-2014 data are excluded because parking fees were collected differently than in 2014 and 2015.

[6] While day use data are collected at Emma Wood State Beach, they have not been collected consistently over time due to funding constraints. Our estimate of the percentage reduction in use for this site is included in Section 3.3.

The data listed in Exhibit 3.1 were used to estimate site-specific Poisson count models of visitation, where the number of recreators or vehicles at a site is modeled as a function of weather, day of week, holidays, month, and other site-specific controls.

Letting y_t represent the count of visitors or vehicles observed on day t, the Poisson regression model specifies the probability of observing y_t as follows:[7]

(3.1) $$P(y_t) = \frac{e^{-\mu_t}\mu_t{}^{y_t}}{y_t!}.$$

where μ_t is the expected count of visitors or vehicles and is a function of explanatory variables (x_t) and coefficients (β). As is standard for a Poisson regression, μ_t is specified as a log-linear function (Cameron and Trivedi, 1998):

(3.2) $$\mu_t = \exp(x_t'\beta).$$

The model is estimated by selecting the coefficients β that maximize the following likelihood function:

(3.3) $$L = \prod_{t=1}^{T} P(y_t)$$

The explanatory variables listed in Exhibit 3.2 were included in x_t:

EXHIBIT 3.2. EXPLANATORY VARIABLES INCLUDED IN DAILY DATA MODELS

VARIABLE	DESCRIPTION
DAY_t^d	1 if the count occurred on the *d*th day of the week and did not occur on a holiday or holiday weekend, as defined below (= 0 otherwise), (*d* = 2, 3, 4, 5, 6, 7).
$MONTH_t^m$	1 if the count occurred during *m*th month of the year (= 0 otherwise), (*m* = 5, 6, 7, 8 for sites with May through September data; highest available month omitted).
JUN_EARLY_t	1 if the count occurred between June 1 and 15 (= 0 otherwise).
MEM_t	1 if the count occurred on Memorial Day weekend (Saturday, Sunday, or Monday) (= 0 otherwise).
$4TH_t$	1 if the count occurred on Fourth of July or the holiday weekend (= 0 otherwise).[8]
$LABOR_t$	1 if the count occurred on Labor Day weekend (Saturday, Sunday, or Monday) (= 0 otherwise).

[7] On many days, multiple spot counts were conducted at UCSB Coal Oil Point Reserve. For this site, y_t represents the count of visits observed at day-time t.

[8] For years when Fourth of July falls on a Tuesday, Wednesday, or Thursday, this variable equals one for that day only. For years when Fourth of July falls on a Monday or a Friday, this variable equals one for the holiday itself and both adjacent weekend days. For years when Fourth of July falls on a Saturday or Sunday, this variable equals one for both weekend days.

VARIABLE	DESCRIPTION
$TEMP_t^{a-b}$	1 if the high temperature at the nearest weather station on day *t* was greater than *a* and less than or equal to *b* (= 0 otherwise), (*a*-*b* = 65-70, 70-75, 75-80, 80-85, 85-90, 90-100).[9]
PPT_t	1 if there was at least 0.1 inches of precipitation reported at the nearest weather station during the most recent 24-hour period (= 0 otherwise).
$WIND_t$	Average daily wind speed on day *t* at the nearest weather station.
$YEAR\_2014\_15_t$	1 if the count occurred in 2014 (or 2015 for predictions) (= 0 otherwise). This variable was only included in the models for Gaviota State Park and Refugio State Beach. Sand was scoured from the beaches at these sites during a spring 2014 storm.
$YEAR\_2015_t$	1 if the count occurred in 2015 (= 0 otherwise). This variable was only included in the pier lot model for San Buenaventura State Beach where a transition from attendant-based parking in 2011-2014 was made to self-pay parking in early summer 2015.
$TIME_t^{a-b}$	1 if the spot count collection time on day *t* was greater than *a* and less than or equal to *b* (= 0 otherwise), (*a*-*b* = 9:00-12:00, 12:00-15:00, 15:00-21:00). These variables were only included in the model for Sands Beach.
$UCSB\_SPRING_t$	1 if the UCSB spring semester was in session (= 0 otherwise). This variable was only included in the model for Sands Beach.
$SBCC_t$	1 if Santa Barbara City College was in session (= 0 otherwise). This variable was only included in the model for Leadbetter Beach.

The estimated models are used to predict the number of recreators or vehicles, μ_t, from (3.2), that would have been at each site in 2015 had the spill not occurred. Specifically, the estimated model coefficients, $\hat{\beta}$, are combined with site- and time-specific factors, x_t, to generate daily predictions (or day-time predictions at Sands Beach) of recreators or vehicles. The resulting predictions control for weather, day of week, holidays, month, and other relevant site-specific factors that are in the model.

The model predictions, μ_t from (3.2), are grouped by two-week periods to smooth the results, and compared with actual 2015 counts associated with the same time periods. The percentage deviation in counts for a time period (D) is then calculated as the actual counts for the period ($Y = \sum y_t$) minus predicted counts for the period ($\hat{Y} = \sum \mu_t$) divided by those predicted counts:

(3.4) $$D = \frac{Y - \hat{Y}}{\hat{Y}}$$

[9] No temperature exceeded 100 degrees in the data. All weather data are from stations monitored by the National Centers for Environmental Information (formerly the National Climatic Data Center).

An additional adjustment is required for sites where the data represent a mixture of visitation for recreation and other purposes – namely, the vehicle traffic counts at Goleta and Arroyo Burro Beach County Parks and the parking fee data from coastal lots along the Santa Barbara Waterfront. Since the estimated deviations at these sites represent changes in *overall* use, they may understate percentage changes in *recreational* visitation, as we would not expect non-recreational visitation to be affected by the spill. Surveys conducted by the Trustees at these sites in early June 2016 are used to estimate the percentage of visitation associated with recreation at each site. The estimated deviations are divided by these percentages to estimate changes in recreational use.

RESULTS

Exhibit 3.3 presents the percentage deviation in use for sites with daily data for each two-week period. Spill impacts occur when the initial deviation at a site is negative and continue until the first two-week period with a non-negative deviation. The highlighted periods in Exhibit 3.3 depict the sites and time periods with spill impacts. Our analysis shows a decline in day use associated with the spill for 16 weeks at Refugio State Beach; for six weeks at El Capitan State Beach; for four weeks at Sands Beach, Goleta Beach County Park, and Arroyo Burro Beach County Park; for 12 weeks at Leadbetter Beach; and for two weeks at Carpinteria State Beach, San Buenaventura State Beach, and Point Mugu State Park. We do not observe a decline in day use at Gaviota State Park, West Beach, or East Beach.

EXHIBIT 3.3. PERCENTAGE DEVIATION BY SITE AND PERIOD, MODELED SITES[A]

Site	May		June		July		August		September	
Gaviota State Park		14.3%	39.8%	20.0%	19.8%	14.3%	29.3%	14.6%	4.0%	34.5%
Refugio State Beach[b]		-100.0%	-100.0%	-100.0%	-100.0%	-24.3%	-16.8%	-14.6%	-2.9%	28.4%
El Capitan State Beach		-100.0%	-100.0%	-61.9%	2.2%	8.8%	5.6%	2.2%	9.2%	39.1%
Sands Beach		-35.8%	-53.1%	10.9%	26.8%	-11.3%				
Goleta Beach County Park		-2.9%	-3.1%	3.7%	-6.3%	-6.5%				
Arroyo Burro Beach County Park		-0.4%	-5.3%	5.1%	0.1%	-2.7%				
Leadbetter Beach		-31.2%	-5.1%	-21.3%	-1.0%	-18.3%	-4.5%	13.5%	20.0%	18.8%
Palm Park Lot (West/East Beach)		1.3%	-6.5%	30.3%	21.0%	12.9%	32.4%	-2.6%	-21.7%	-45.7%
Cabrillo Lots (East Beach)		26.1%	21.8%	49.7%	19.0%	33.5%	78.3%	30.2%	55.5%	29.3%
Carpinteria State Beach		-9.8%	12.3%	24.9%	2.0%	-0.5%	31.8%	-2.8%	-9.9%	16.7%
San Buenaventura State Beach		-10.6%	13.3%	28.1%	56.1%	19.5%	81.1%	97.2%	56.0%	-1.4%
Point Mugu State Park		-2.0%	5.4%	11.8%	10.8%	28.4%	24.0%	-35.4%		

Notes:
[a] – Sites and time periods with a spill impact are highlighted.
[b] – Since the closure at Refugio State Beach began on May 19, 2015, the first period for this site includes 15 rather than 14 days.

3.3 PERCENTAGE REDUCTION IN USE FOR OTHER SITES

Santa Barbara and Ventura Counties include additional coastal recreation sites beyond those included in Exhibit 3.3. We describe our approach for estimating the percentage reduction in use at these sites in the sections below.

POCKET BEACHES

Tajiguas, Venadito, and Las Flores Beaches are small pocket beaches adjacent to Refugio and El Capitan State Beaches. As shown in Exhibit 2.4, these beaches were closed between May 21 and August 28, 2015, resulting in a 100 percent reduction in use during this period.

COAL OIL POINT AREA

The Trustees conducted spot counts twice per day for 10 days at Haskell's Beach, Sands Beach, Devereux Beach, and Campus Point Beach in late May and early June in 2015 and 2016 (5/29/15 to 6/7/15 and 6/3/16 to 6/12/16). The 2015 data collection times were replicated in 2016 to aid in year-over-year comparisons. Because of the small samples, we compared site-level sums across years rather than constructing daily models with multiple explanatory variables. No adjustments were made for weather or other factors, which were relatively constant across years.

We observe a decline in 2015 use relative to 2016 for Haskell's and Sands Beaches (34 and 32 percent, respectively) similar to the percentage reduction in use reported in Exhibit 3.3 for Sands Beach. Given these results, we adapt the percentage reduction in use for Sands Beach from Exhibit 3.3 for the stretch of coastline between Haskell's and Sands Beaches. We do not find a decline in use for Devereux or Campus Point Beaches.

EXTRAPOLATION APPROACH FOR OTHER SITES

Visitation data were available for some other sites in Santa Barbara and Ventura Counties, but were examined and determined to be unsuitable for estimating changes in visitation due to limited temporal resolution or other factors. We therefore calculated the percentage reduction in use for all other coastal sites in the two counties by extrapolating from percentage reductions estimated at nearby sites. Specifically, the percentage decline for each two-week period was estimated as the average of the percentage declines at the nearest upcoast and downcoast sites with adequate data.[10] This extrapolation approach is consistent with levels of oiling, advisories and closures, and site characteristics, which are spatially correlated.

Exhibit 3.4 summarizes the estimated percentage reduction in use by site and two-week period. The exhibit incorporates results presented in Section 3.3 and estimates for segments of coast where we use the extrapolation approach.[11]

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[10] In cases where the duration of decline differs for the two boundary sites, a value of zero percent is used in the average calculation for the site with no estimated decline. For example, sites between Arroyo Burro Breach County Park and Leadbetter Beach are assigned the average percentage reduction in use of those two sites. Since the spill decline at Arroyo Burro lasted four weeks and the decline at Leadbetter lasted 12 weeks, the two-week averages are computed using a zero percent decline at Arroyo Burro for weeks five to 12.

[11] The Trustees do not claim for any spill-related losses for the segments of coast between Gaviota State Park and Tajiguas Beach and between Point Mugu State Park and the Los Angeles County line due to uncertainty about the applicability of the approach for these two segments. Baseline recreational use in these areas is expected to be low compared to the surrounding sites.

EXHIBIT 3.4. PERCENTAGE REDUCTION IN USE BY SITE AND PERIOD, SUMMARY

Site	May	June			July		August		September
1. Gaviota State Park	No impact quantified								
2. Pocket Beaches[a]		-100.0%	-100.0%	-100.0%	-100.0%	-100.0%	-100.0%	-100.0%	-22.4%
3. Refugio State Beach[b]		-100.0%	-100.0%	-100.0%	-100.0%	-24.3%	-16.8%	-14.6%	-2.9%
4. El Capitan State Beach		-100.0%	-100.0%	-61.9%					
5. Haskell's Beach		-35.8%	-53.1%						
Sites between 5 and 6		-35.8%	-53.1%						
6. Sands Beach		-35.8%	-53.1%						
7. Deveruex and Campus Point Beaches	No impact quantified								
8. Goleta Beach County Park		-2.9%	-3.1%						
Sites between 8 and 9		-1.7%	-4.2%						
9. Arroyo Burro Beach County Park		-0.4%	-5.3%						
Sites between 9 and 10		-15.8%	-5.2%	-10.6%	-0.5%	-9.2%	-2.2%		
10. Leadbetter Beach		-31.2%	-5.1%	-21.3%	-1.0%	-18.3%	-4.5%		
11. West and East Beaches	No impact quantified								
Sites between 11 and 12		-4.9%							
12. Carpinteria State Beach		-9.8%							
Sites between 12 and 13		-10.2%							
13. San Buenaventura State Beach		-10.6%							
Sites between 13 and 14		-6.3%							
14. Point Mugu State Park		-2.0%							

Notes:
[a] – Since the closure at the pocket beaches began on May 21, 2015, the first period for this site includes 13 rather than 14 days. The percentage reduction in use for the final two-week period was calculated using the fraction of baseline use occurring up until the end of the closure on August 28 (described further in Section 3.4).
[b] – Since the closure at Refugio State Beach began on May 19, 2015, the first period for this site includes 15 rather than 14 days.

3.4 BASELINE USE

This section describes our approach for estimating baseline use levels at impacted sites. Baseline use represents the level of recreation use that would have existed had the spill not occurred. We multiply these baseline use estimates by our site-specific estimates of the percentage reduction in use to calculate lost days due to the spill.

For some sites, we are able to develop comprehensive estimates of baseline use from available onsite data. These sites include Refugio and El Capitan State Beaches, the pocket beaches, and Goleta and Arroyo Burro Beach County Parks. For the remaining sites, we rely on information from the MPA Baseline survey (Chen et al., 2015).

REFUGIO AND EL CAPITAN STATE BEACHES, THE POCKET BEACHES, AND GOLETA AND ARROYO BURRO BEACH COUNTY PARKS

Below, we describe the source data and method for estimating baseline use at each site with comprehensive onsite data.

- Refugio State Beach: The Refugio day use data include counts of the number of vehicles paying a daily fee or using a State Parks Annual Pass. The California Department of Parks and Recreation has data on the average number of individuals per vehicle that we use to convert vehicle counts to estimates of visitation. Since walk-in visitation at this site is uncommon, we use the vehicle

day use data to estimate baseline use.[12] We multiplied the model predictions for 2015 (described in Section 3.2) by the average number of individuals per vehicle to estimate baseline use in each two-week period.

- El Capitan State Beach: The El Capitan day use data include all visitors entering in vehicles, but exclude visitors entering by foot or bicycles (hereafter, "walk-in" use). The primary sources of walk-in use are the two private campgrounds on the north side of Highway 101: El Capitan Canyon and Ocean Mesa. Interval counts of walk-in users were conducted at El Capitan State Beach on a sample of days and times between June 1 and 14, 2016. Interval counts enumerate all visitors departing from (or arriving to) a site during a time period. Interviews were also conducted to identify visitors leaving for the last time and to determine the purpose of visits (i.e., to distinguish recreators from non-recreators). These data were used to estimate recreation walk-in use for the entire two-week period. We calculated the ratio of walk-in use to camping use at El Capitan State Beach during the data collection period in 2016.[13] This ratio was applied to predicted baseline camping use for each two-week period in 2015 to estimate baseline walk-in use during the same periods.[14] We estimated baseline vehicle use using the same method described above for Refugio State Beach. Estimates of walk-in and vehicle use were combined to estimate total baseline use.
- Pocket beaches: Interval counts and interviews were conducted at Tajiguas Beach on the same sample of days as El Capitan State Beach between June 1 and 14, 2016. These data were used to estimate recreation use for the entire two-week period. Spot counts of parked vehicles were also conducted several times a day at Tajiguas, Venadito, and Las Flores Beaches on days when interval counts were conducted at Tajiguas. These data were used to estimate use at Venadito and Las Flores Beaches relative to Tajiguas Beach. Finally, we calculated the ratio of pocket beach visitation to day use at Refugio and El Capitan State Beaches during the data collection period in 2016. This ratio was applied to predicted baseline use at the two state parks for each two-week period in 2015 to estimate baseline use at the pocket beaches during the same periods.
- Goleta and Arroyo Beach County Parks: Interval counts of vehicles and pedestrians were conducted at entrances to these sites on a sample of days and times between June 1 and 14, 2016. Interviews were conducted to identify visitors leaving the site for the last time and to determine the purpose of visits (i.e., to distinguish recreators from non-recreators). The interval count data were

[12] Some visitors may arrive by foot via the Aniso Trail, which connects El Capitan and Refugio State Beaches. However, these visitors would likely have accessed the trail from El Capitan or one of the pocket beaches and would therefore be included in the estimates for those sites.

[13] We use camping use because walk-in users come primarily from the two private campgrounds and we expect El Capitan State Beach camping use to be correlated with camping at those campgrounds.

[14] Our approach for estimating baseline camping use in 2015 is described in Leggett et al. (2018).

combined with data from automated vehicle counters at the site entrances to estimate the ratio of recreators to counted vehicles. These site-specific ratios were applied to predicted traffic counts for each two-week period in 2015 (described in Section 3.2) to estimate baseline recreation use during the same periods.

OTHER SITES

We rely on information from the MPA Baseline survey to develop estimates of baseline use at all other sites. The MPA Baseline data were generated through a general-population online survey of Southern California residents, conducted in 2012-2013 to estimate the amount and types of visitation at locations throughout the South Coast region (Chen et al., 2015). The survey collected data over four independent quarterly waves from 4,492 residents of 10 South Coast counties: San Luis Obispo, Kern, San Bernardino, Santa Barbara, Ventura, Los Angeles, Orange, Riverside, San Deigo, and Imperial. As part of the survey, respondents were asked to place markers on a map to indicate the location of their most recent trip to the South Coast. The survey contractor (Knowledge Networks) developed weights that allow the sample data to be aggregated to the population of adult residents of the 10 counties. We used the survey data, sampling weights, and marked trip locations to estimate annual trips to sites along the South Coast. The number of annual trips to the *j*th site is estimated as:

$$(3.5) \qquad Trips_j = \sum_{i=1}^{n} \frac{t_i w_i r_i d_{ij}}{k_i},$$

where:

t_i = number of coastal trips taken by respondent *i* over last 12 months.

w_i = survey weight associated with respondent *i*.

r_i = 1 if the primary purpose of respondent *i*'s most recent coastal trip was non-camping recreation (=0 otherwise).

d_{ij} = 1 if respondent *i* visited site *j* on most recent coastal trip (=0 otherwise).

k_i = number of sites visited on respondent *i*'s most recent coastal trip.

As a final step, the annual MPA baseline trip estimates were allocated to the two-week periods used in analysis (see Exhibit 3.4). This allocation was implemented using the daily onsite visitation data available for Goleta and Arroyo Burro Beach County Parks, Leadbetter Beach, Carpinteria State Beach, San Buenaventura State Beach, and Point Mugu State Park (i.e., based on the fraction of annual use occurring within a two-week period). For sites in between, we use the average proportion of use in a period from the two boundary sites.

For validation purposes, the MPA Baseline trip estimates were compared to onsite trip estimates for a subset of sites in the Goleta area where comprehensive onsite visitation estimates were available (Gaviota State Park, Refugio State Beach, El Capitan State

Beach, Goleta County Park, and Arroyo Burro County Park). The aggregate difference in estimated trips for these sites was less than five percent.

ESTIMATES OF BASELINE USE

Exhibit 3.5 summarizes baseline use estimates by site and two-week period. Estimates are only provided for sites and time periods that had reductions in shoreline use in Santa Barbara and Ventura Counties (Exhibit 3.4).

EXHIBIT 3.5. BASELINE DAYS BY SITE AND PERIOD

Site	May	June	July	August	September
1. Gaviota State Park	No impact quantified				
2. Pocket Beaches[a]					
3. Refugio State Beach[b]					
4. El Capitan State Beach					
5. Haskell's Beach					
Sites between 5 and 6					
6. Sands Beach					
7. Deveruex and Campus Point Beaches	No impact quantified				
8. Goleta Beach County Park					
Sites between 8 and 9					
9. Arroyo Burro Beach County Park					
Sites between 9 and 10					
10. Leadbetter Beach					
11. West and East Beaches	No impact quantified				
Sites between 11 and 12					
12. Carpinteria State Beach					
Sites between 12 and 13					
13. San Buenaventura State Beach					
Sites between 13 and 14					
14. Point Mugu State Park					

Notes:
[a] – Since the closure at the pocket beaches began on May 21, 2015, the first period for this site includes 13 rather than 14 days.
[b] – Since the closure at Refugio State Beach began on May 19, 2015, the first period for this site includes 15 rather than 14 days.

3.5 SUMMARY OF LOST DAYS IN SANTA BARBARA AND VENTURA COUNTIES

Lost days in Santa Barbara and Ventura Counties are calculated by multiplying the percentage reduction in use for a particular site and period (Exhibit 3.4) by the corresponding baseline use estimate (Exhibit 3.5). Exhibit 3.6 summarizes our estimates of lost days by site. In total we estimate 89,380 lost days in these two counties: 72,073 in Santa Barbara County and 17,307 in Ventura County.

EXHIBIT 3.6. SUMMARY OF LOST DAYS IN SANTA BARBARA AND VENTURA COUNTIES

SITE	LOST DAYS
1. Gaviota State Park	No impact quantified
2. Pocket Beaches	2,644
3. Refugio State Beach	18,338
4. El Capitan State Beach	12,768
5. Haskell's Beach	4,036
Sites between 5 and 6	8,099
6. Sands Beach	1,632
7. Devereux Beach and Campus Point Beach	No impact quantified
8. Goleta Beach County Park	2,298
Sites between 8 and 9	82
9. Arroyo Burro Beach County Park	1,482
Sites between 9 and 10	4,799
10. Leadbetter Beach	13,890
11. West and East Beaches	No impact quantified
Sites between 11 and 12	874
12. Carpinteria State Beach	632
Sites between 12 and 13	5,256
13. San Buenaventura State Beach	3,428
Sites between 13 and 14	9,001
14. Point Mugu State Park	121
Total	**89,380**

Notes:
The totals differ slightly from the product of the estimates in Exhibits 3.4 and 3.5 due to rounding.

CHAPTER 4 | VALUATION AND SUMMARY OF DAMAGES

This chapter describes our valuation approach and summary of damages. The first section describes our method for estimating the value per lost day in Santa Barbara and Ventura Counties. The second section presents our approach for estimating losses in Los Angeles County. The final section summarizes our total damages estimate.

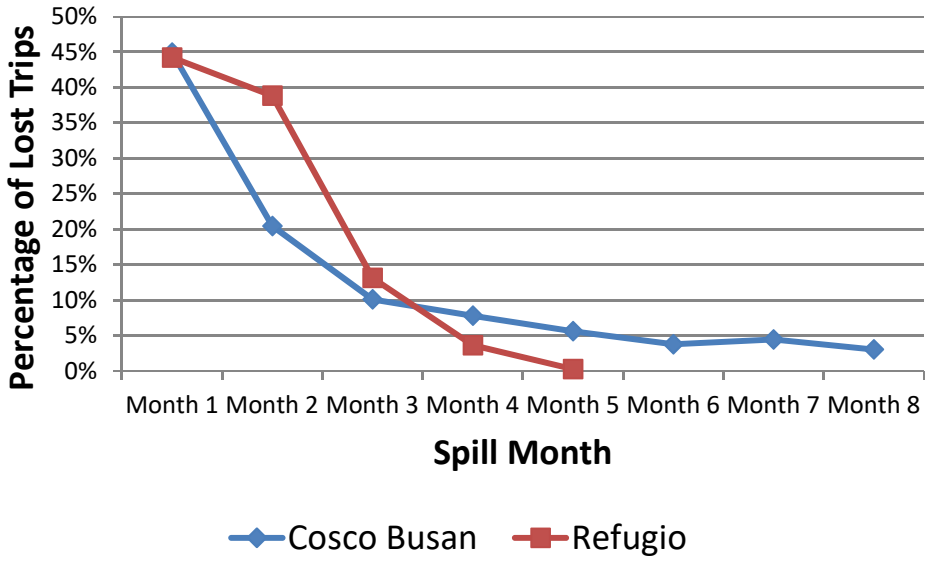
4.1 VALUE PER LOST DAY IN SANTA BARBARA AND VENTURA COUNTIES

We estimated the value per lost day in Santa Barbara and Ventura Counties using benefits transfer. Benefits transfer is the process of adapting trip or day values from existing literature to fit the conditions associated with the site, activity, and incident of interest. The methodology has been used to assess recreational use damages for several past oil spills (Chapman and Hanemann, 2001; Curry and Scherer, 2010; Leggett and Curry, 2010). We reviewed literature that estimates the value of shoreline use for the benefits transfer. Based on our review, we selected a value from English (2010), which was estimated using a travel cost model for the *Cosco Busan* oil spill damage assessment. The *Cosco Busan* oil spill occurred when a container ship struck the Bay Bridge in November 2007, spilling 53,569 gallons of oil into San Francisco Bay and the Pacific Ocean.

We considered other California beach valuation studies for the benefits transfer, including Hanemann et al. (2004), Lew and Larson (2008), and Leggett et al. (2014). However, these studies do not provide value estimates reflecting the mixture of impacts observed in Santa Barbara and Ventura Counties during the Refugio Beach oil spill, namely, closures, advisories, and other impacts from oiling and spill response. The value from English (2010) represents this mixture of spill impacts. Specifically, recreators affected by the *Cosco Busan* and Refugio Beach oil spills may have derived less enjoyment from their trips to sites affected by the spill (diminished trips); selected alternative, less desirable locations (substitute trips); or pursued alternative activities (lost trips). The approach used by English (2010) generates a value per lost trip that incorporates these three behavioral responses to a spill.

Further, the two spills are similar with respect to the availability of substitute sites, the types of affected shoreline recreation activities, and the recovery pattern of recreation impacts. Exhibit 4.1 compares the percentage of total lost trips by month for the *Cosco Busan* and Refugio Beach oil spills, which are broadly similar.

EXHIBIT 4.1. TIMING OF LOST SHORELINE TRIPS, COSCO BUSAN AND REFUGIO BEACH OIL SPILLS



The travel cost model developed by English (2010) relies on a telephone survey of San Francisco Bay Area residents conducted in the summer of 2008. The survey collected information about the number and characteristics of single-day shoreline recreation trips to coastal sites in the Bay Area. Respondents were asked to provide the number of trips they typically take to these beaches and the number of trips that were diverted (i.e., lost) in the months following the *Cosco Busan* spill. They were also asked to report the destination, activity, mode of transportation, and group size for several recent shoreline recreation trips (i.e., during a time period when spill impacts had largely dissipated). The data on recent trips were used to develop a multiple-site travel cost model for shoreline recreation in the Bay Area.[15] This baseline model was adjusted to represent reported changes in trip-taking behavior following the spill. Changes in welfare between the baseline and adjusted models were used to estimate the value per lost trip due to the spill.

English (2010) reports an average value per lost trip of $18.25 in 2007 dollars. This average reflects losses over a period of 8 months (Exhibit 4.1), where the estimated value per lost trip was highest in the months immediately after the spill—due to numerous closures, advisories, and other impacts—and lowest in later months when most beaches had reopened and other impacts had dissipated (see Table J.5 in English (2010)).[16] This

[15] The travel cost variable included in the model incorporates round-trip out-of-pocket costs such as gasoline and depreciation, and the opportunity cost of time associated with traveling to the site. Out-of-pocket costs were calculated using a rate of 21 cents per vehicle mile (or 8.4 cents per miles per passenger). The opportunity cost of time was calculated as one-third of a respondent's hourly household income.

[16] The average value of $18.25 is a weighted average of lost values by month using the corresponding lost trips as the weights.

decline in the value per lost trip reflects the increasing availability of non-impacted substitute sites over time, as the impact of the spill diminished.

We adjusted the average value estimate from English (2010) to July 2018 dollars using the consumer price index (CPI) (Bureau of Labor Statistics, 2018). Our estimate of the value per lost day in Santa Barbara and Ventura Counties is $21.45.

4.2 LOST VALUE DUE TO IMPACTS IN LOS ANGELES COUNTY

Our quantification of impacts in Los Angeles County focuses on the closures in South Santa Monica Bay and Long Beach (Exhibit 2.4). We obtained data for other areas of the county (i.e., outside South Santa Monica Bay and Long Beach) that remained open during the spill, including parking sales data at Zuma Beach and Point Dume State Beach, lifeguard counts of beach visitation, as well as counts of visitation in and around marine protected areas off the coast of Malibu and Palos Verdes. The data for these other areas were not indicative of a reduction in recreation use as a result of the spill.[17]

We estimated shoreline use damages due to the beach closures in Los Angeles County using the Southern California Beach Recreation Valuation Model (Hanemann et al., 2004; Hanemann, Pendleton, and Mohn, 2005; Leeworthy et al., 2007). This random utility travel cost model can be used to assess the economic impacts of changes in water quality and beach closures in Southern California. One of the primary motivations for developing the model was to support the estimation of recreational use losses for damage assessments. It relies on panel data from telephone surveys of residents of four Southern California counties, which were conducted in 1999-2000.[18] The surveys collected information about the number and characteristics of shoreline recreation trips to 53 beaches, with a specific focus on beaches in Los Angeles and Orange Counties. The model directly estimates the total lost value from a reduction in water quality or beach closure(s) by predicting changes in the amount and location of beach use (e.g., recreators substituting to other sites or to other types of activities) and estimating the total decline in value associated with this change in use.[19]

Our approach for estimating lost value in Los Angeles County proceeds differently from our approach for Santa Barbara and Ventura Counties. For those two counties, we separately estimated the number of lost days and the value per lost day, and then multiplied the two estimates. We considered available data sources for Los Angeles County to estimate lost trips associated with the beach closures in South Santa Monica Bay and Long Beach, namely lifeguard counts of visitation. However, we consider the

[17] In some cases these sources were limited in temporal resolution or suffered from other data quality issues. However, they represent the best-available information. Further, our conclusions based on these data were corroborated by conversations with local resource managers.

[18] Residents of Los Angeles, Orange, Riverside, and San Bernardino Counties were surveyed.

[19] The travel cost variable included in the model incorporates round-trip out-of-pocket costs such as gasoline and maintenance and the opportunity cost of time associated with traveling to the site. Out-of-pocket costs were calculated using a rate of 14.5 cents per mile per vehicle. The opportunity cost of time was calculated as 50 percent of a respondent's hourly income times the travel time.

model from Hanemann et al. (2004) to be the best available information. The Hanemann et al. (2004) model quantifies lost shoreline days and the associated lost economic value within the model, and the output is simply lost value.

The model can be used to estimate the total lost value associated with a range of scenarios, including single and multi-site closures. Further, closures at the site level can be specified as encompassing one or more of the following three beach areas: water, sand, and pavement (e.g., paved bike path running along the beach). Lastly, the duration and timing of the closures can be specified as the number of days within a given month. We used the model to estimate the total lost value associated with the Los Angeles County beach closures summarized in Exhibit 2.4. Specifically, we used the model to evaluate the scenarios described in the bullets below.

- **South Santa Monica Bay**: a one day water-only closure in May for Manhattan Beach and a two day water-only closure in May for Manhattan, Hermosa, and Redondo Beaches.
- **Long Beach**: a three day water-only closure in June for Long Beach (between 1st Place and 72nd Place).[20]

The actual closures in South Santa Monica Bay and Long Beach included the section of beach seaward of the lifeguard towers and all of the water. Our decision to close the water only may underestimate damages. However, a partial beach closure cannot be specified in the available modeling tool.

We make three adjustments to the model results. First, the model only estimates losses associated with single-day trips, which represent 92.9 percent of annual person days from the four surveyed counties (see Table 5 in Leeworthy et al., 2007). Therefore, the loss estimate is divided by 92.9 percent to incorporate losses associated with multiple-day trips. Second, the loss estimate is increased by 15 percent to account for population growth in the four surveyed counties since the survey year (2000) (U.S. Census Bureau 2018, 2000). Finally, we adjust the estimates to July 2018 dollars using the consumer price index (CPI) (Bureau of Labor Statistics, 2018).

Our undiscounted damages estimate for the Los Angeles County beach closures is $537,568. The estimates for the South Santa Monica Bay and Long Beach closures are $445,125 and $92,444, respectively. These represent lower bound estimates of damages since they do not incorporate impacts to recreators who live outside the four surveyed counties, and do not consider the beach closures between the water and lifeguard towers.

4.3 SUMMARY OF DAMAGES

We combine our estimate of lost shoreline days (89,380) in Santa Barbara and Ventura Counties with the estimated value per day ($21.45) to calculate damages for these two counties. Present value damages as of July 2018 are calculated using monthly discounting

[20] The Southern California Beach Recreation Valuation Model includes two sites for Long Beach between 1st Place and 72nd Place: Long Beach and Belmont Shore. Both sites are closed to evaluate the Long Beach closure scenario.

at an annual rate of three percent (NOAA, 1999). To implement monthly discounting, we assign the two-week loss periods (Exhibit 3.4) to the month that includes the majority of the period. Exhibit 4.2 presents the distribution of losses by month for Santa Barbara and Ventura Counties.

EXHIBIT 4.2. TEMPORAL DISTRIBUTION OF SHORELINE USE LOSSES, SANTA BARBARA AND VENTURA COUNTIES

MAY	JUNE	JULY	AUGUST	SEPTEMBER
44%	39%	13%	4%	<1%

Present value damages for Los Angeles County are calculated using the same monthly discounting approach. Based on the date of closures, South Santa Monica Bay losses are assigned to May and Long Beach losses are assigned to June. Exhibit 4.3 presents shoreline use damages by county and in total. Our total estimate of damages associated with impacts to shoreline use as of July 2018 is $2,691,534.

EXHIBIT 4.3. SUMMARY OF SHORELINE USE DAMAGES

COUNTY	DISCOUNTED DAMAGES (2018 DOLLARS)
Santa Barbara County	$1,693,790
Ventura County	$407,677
Los Angeles County	$590,067
Total	**$2,691,534**

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