4.10 Lost Recreational Use

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Executive Summary

The Gulf of Mexico is a popular destination for many types of recreation. The *Deepwater Horizon* (DWH) oil spill resulted in losses to the public's use of natural resources for outdoor recreation, such as boating, fishing, and going to the beach. These spill impacts in the Gulf of Mexico started in May 2010 and lasted through November 2011. The Trustees conducted a number of studies to measure the lost recreational value to the public due to the spill. Recreational use was evaluated in coastal areas of Texas, Louisiana, Mississippi, Alabama, and Florida, and losses were evaluated for residents throughout the contiguous United States.

The Trustees estimated that the public lost 16,857,116 user days of boating, fishing, and beach-going experiences as a result of the spill. Losses occurred across multiple years, and the final estimates were compounded to 2015 using a 3 percent interest rate and adjusted to 2015 price levels.[1] Total recreational use damages due to the spill are estimated to be $693.2 million with uncertainty ranging

[1] All dollar values in the section are presented in July 2015 price levels unless otherwise noted.

from $527.6 million to $858.9 million.[2,3] This lost value does not include losses to private businesses/individuals or lost tax revenue to municipalities, which are not compensable under NRDA regulations.

This section provides an overview of the Trustees' assessment approach for recreational losses. Additional details are available in a set of technical memos provided in the Administrative Record.[4]

4.10.1 Introduction

Key Findings

- The DWH oil spill resulted in losses to the public's use of natural resources for outdoor recreation, such as boating, fishing, and going to the beach.
- These spill impacts in the Gulf of Mexico started in May 2010 and lasted through November 2011.
- The Trustees estimate the value of recreational losses to the public from the oil spill to be $693.2 million with uncertainty ranging from $527.6 million to $858.9 million.
- As a result of the spill, the public lost over 16 million user days of boating, fishing, and beach-going experiences.

The Gulf of Mexico is a popular destination for a wide variety of recreational activities, which draw people not only from the region but from all across the country. Activities including boating, fishing, and beach-going depend directly on the environmental quality of the Gulf of Mexico's natural resources and the ability to access them. When an event such as the DWH oil spill degrades the quality of shorelines and water resources, there are severe impacts to recreational use.

Following the spill, the presence of oil on beaches or in the water degraded that quality and/or accessibility. For example, some beaches were closed due to oiling or cleanup activities while others remained open with posted advisories. Furthermore, even the expectation of oiling caused individuals to cancel planned trips to coastal areas. The oil spill affected recreation in the Gulf of Mexico through people cancelling trips, people choosing alternate sites for recreation, and people experiencing a reduction in the quality of their recreational activities.

4.10.1.1 Recreational Use

In assessing the lost use damages due to the spill, the Trustees measured impacts to two broad categories of recreation: shoreline use and boating.

[2] An approximation of the 95% confidence interval for this estimate is derived by adding a point estimate for the Tier 2 subset of total recreational use damages to the upper and lower 95% confidence interval of the Tier 1 recreational use damages, recognizing that the statistical uncertainty of the Tier 2 estimates is unknown.

[3] In comparison, in the 2007 *Cosco Busan* oil spill in San Francisco Bay, Trustees assessed approximately 1 million lost recreational user days valued at $22.2 million (2010 U.S.). In the 1990 *American Trader* oil spill in southern California, Trustees assessed 0.76 million lost recreation user days valued at $12.2 million (1990 U.S.).

[4] The data collected by Trustees for the lost recreational use assessment is available at *https://dwhdiver.orr.noaa.gov*.

- **Shoreline use** refers to recreational activities conducted by individuals at locations near beaches and other shoreline areas. These activities include swimming, sunbathing, surfing, walking, kayaking, and fishing that takes place from the shore or shoreline structures such as piers.
- **Boating** includes a variety of recreational boating activities that begin at sites providing access to salt water near the Gulf Coast, including marinas, unimproved launches, and private residences. Boat-based fishing is included in this category.

The Trustees measured the severity, extent, and duration of the adverse effects to recreational activities by evaluating the public's recreation patterns and determining how those changed because of the spill.

A "user day" refers to any time an individual visits a beach, goes fishing, or goes boating for the purpose of recreation for at least part of the day.

The Trustees began conducting studies on recreational use in the Gulf of Mexico shortly after the spill began and continued to do so for up to 3 years for many types of activities and locations. These studies yielded estimates of visitation which, when compared to the amount of visitation that would have occurred without the spill, determined the number of lost user days. This measure is an indicator of the severity of the impact from the spill across both space and time. Trustees evaluated factors other than the spill that could have affected coastal recreation (such as weather and macroeconomic conditions) and accounted for them with adjustments to predictions of baseline when necessary. The result is an estimate of lost user days that is exclusively attributable to the spill.

4.10.1.2 Defining Public Losses

To determine recreation damages, the Trustees measured the loss in recreation value provided by Trust resources to the public. The Oil Pollution Act of 1990 (OPA) defines value as "the maximum amount of goods, services, or money an individual is willing to give up to obtain a specific good or service" (15 CFR §990.30). This reduction in value is calculated for all individuals who potentially use the public resources for recreational purposes. The Trustees used the estimates of lost user days combined with models of recreational demand to measure the lost recreational value due to the spill. This approach generated a value per lost user day that includes three behavioral responses to the oil spill presented in Figure 4.10-1:

- Canceling trips (lost trips).
- Taking trips to different locations (substitute trips).
- Continuing to take trips to the same locations, but under conditions that reduce enjoyment (diminished-value trips).

This approach also takes into account the fact that some individuals are unaffected by the spill and do not contribute to the estimate of damages.

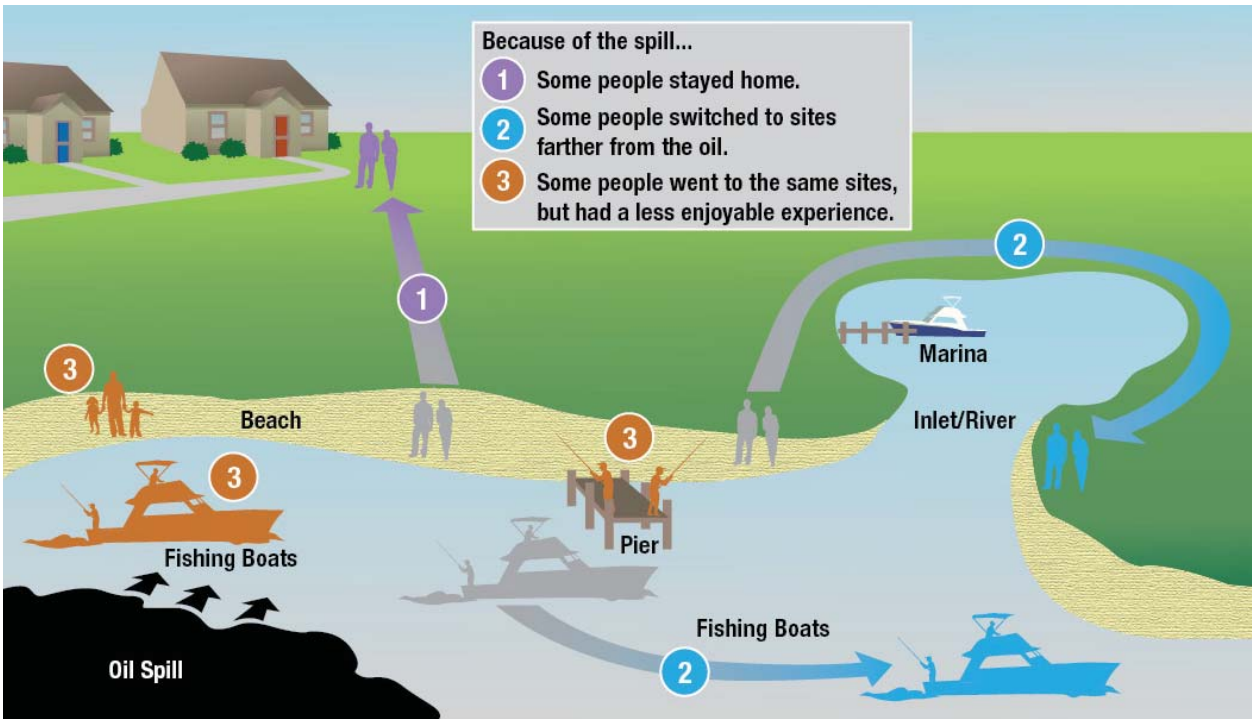

Figure 4.10-1. Recreational users reacted to the oil spill in different ways.

4.10.2 Economic Damages

Marine and coastal natural resources of the Gulf of Mexico provide recreational services to individuals from across the United States and around the world. These services have economic value, just like services from private amusement facilities such as Walt Disney World. Many natural resources are publicly owned, so the services they provide do not have observable prices as do goods and services in monetary economic transactions. For example, goods in a grocery store have a dollar price, and a monetary transaction takes place when those goods are sold. Although recreational services from public resources are not sold on markets, they still have value.

When an oil spill impacts natural resources, it diminishes the value of the recreational services they provide. The reduction in the number of people using the affected resources is an important determinant of that lost value. Another important indicator of lost value is the distance people travel and the expenses they incur to reach the resources under unoiled conditions. Economic models can use this type of information to estimate the lost recreational value attributable to the spill.

A spill can also cause other types of economic losses, both public and private, which are outside the scope of the Trustees' assessment. Private losses are generally associated with declines in business profits, lost wages, or costs of repairing property damage caused by the spill. Public economic losses that are outside the scope of the Trustees' assessment include losses in revenue from taxes or fees collected by local municipalities. Impacts to habitats and wildlife represent losses in value that are part of the Trustees' assessment; these impacts are addressed in other sections of Chapter 4. Table 4.10-1 lists examples of economic losses potentially recoverable under OPA (Natural Resource Trustee Claims) and those that are not (Other Claims). (This is not an exhaustive list.)

Table 4.10-1. OPA categories of potential economic damages from an oil spill.

Natural Resource Trustee Claims	Other Claims
Lost recreational use	Lost business profits
	Lost government taxes
Impacts to habitat and wildlife	Royalties, fees, rents
	Lost wages
	Injury to real or personal property
	Costs of increased public services to address the spill

4.10.3 Characterization of Injury

The damage assessment conducted by the Trustees for the DWH oil spill combines two studies addressing different components of lost recreational use damages. One study measures lost user days through a series of in-person surveys, infield counts, and counts of users in aerial photographs. The second estimates lost value per lost user day by modeling demand for recreation, using information collected in mail and telephone surveys. Figure 4.10-2 illustrates the overall assessment approach, described in detail throughout Section 4.10. As background, Section 4.10.3 describes the information gathered on the extent of activities potentially affected, restrictions on recreation activity, and public awareness of the spill.

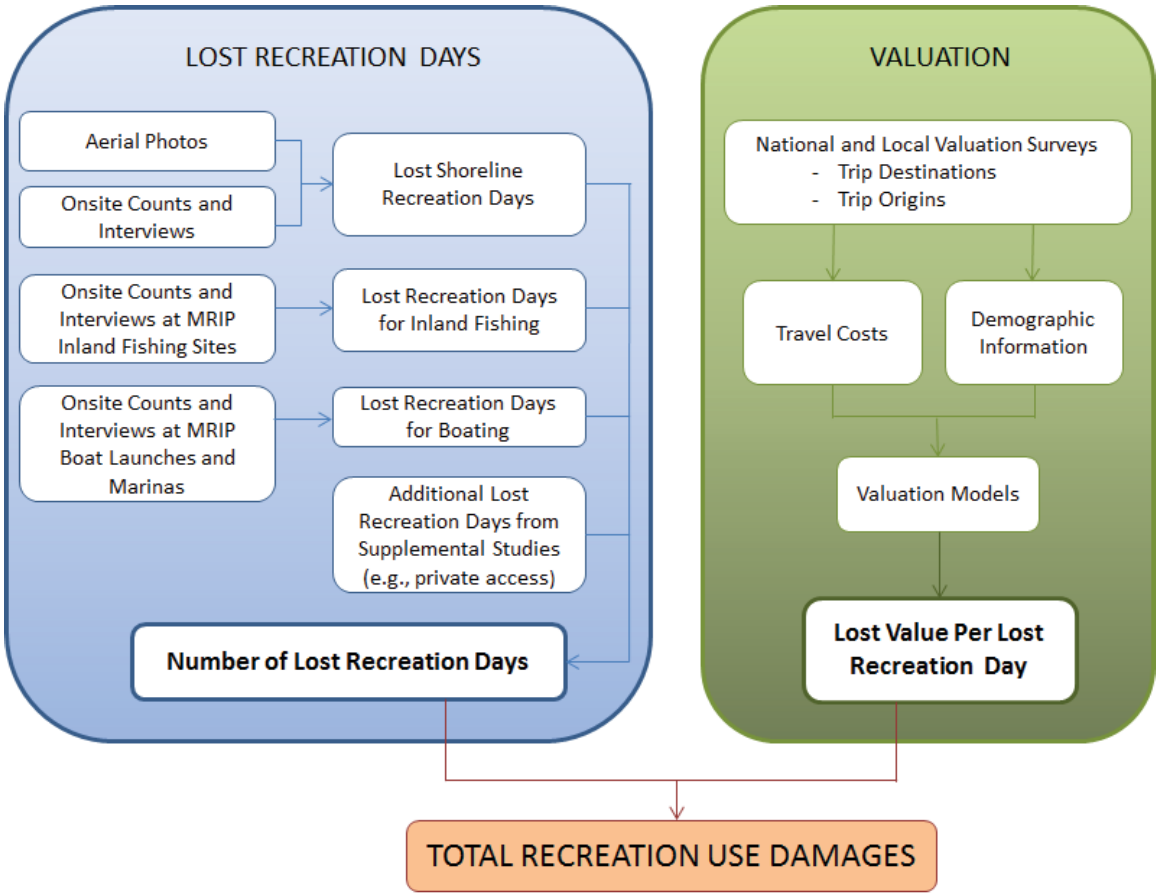

Figure 4.10-2. The Trustees used a number of different data sources to estimate the total recreational use damages.

4.10.3.1 Scope of Spill Impacts

4.10.3.1.1 Recreation in the Gulf Before the Spill

To help understand the levels of recreational activities prior to the spill, the Trustees turned to several federal government studies that have been ongoing for decades.

Data collected by NOAA as part of the Marine Recreational Information Program (MRIP) indicate that from 2000 to 2009 there were on average about 13.6 million annual saltwater boat fishing trips and 8.7 million annual saltwater shore fishing trips to locations along the Gulf of Mexico from Louisiana to Florida (Welsh 2015a).

The U.S. Fish and Wildlife Service periodically conducts a National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. This survey provides an estimate of the number of anglers taking trips to saltwater locations and the number of days spent fishing at saltwater locations on a state-by-state basis. The last phase of the survey prior to the spill estimated that in 2006 there were 2.5 million anglers who spent a total of 27.4 million user days visiting saltwater locations in Louisiana, Mississippi, Alabama, and Florida.[5]

Data from the National Survey on Recreation and the Environment, conducted between 2005 and 2007, indicate that there were about 191.8 million saltwater-related recreation user days in Louisiana, Mississippi, Alabama, and the Gulf Coast of Florida annually. A wide range of activities were associated with these saltwater recreation trips, including water contact activities (swimming, snorkeling, scuba diving, and surfing), boating (motorboating, sailing, and using personal watercraft), fishing, hunting, and nature/wildlife viewing.

4.10.3.1.2 Public Awareness of the Spill

Due to widespread press coverage, there was a high level of public awareness of the spill. Beginning in April 2010, spill-related information was provided by a Joint Information Center managed by the U.S. Coast Guard. From April 21, 2010, through February 2013, the Joint Information Center issued over 600 press releases about the spill, with the great majority of these in 2010.

These press releases were provided to media outlets and, along with other sources of information, formed the basis for numerous television, newspaper, radio, and online reports about the spill. A general indication of public awareness can be seen in a Pew Research Center study conducted in late-July 2010, in which 59 percent of respondents said they were following news about the spill "very closely" (Welsh 2015c).

A CNN report on April 20, 2011, the first anniversary of the spill, discussed the popularity of the "spillcam" showing live feeds of the oil spill. This feed was first made available by the U.S. House of Representatives Select Committee for Energy Independence and Global Warming. CNN reported that a day after the live feed became available it had already been viewed a million times, and that traffic was so heavy it "temporarily crashed the House of Representative's Web system" (Welsh 2015c).

[5] This estimate includes all saltwater locations in Florida, including the Gulf and Atlantic coasts.

The Vanderbilt Television News Archive provides a searchable database of news coverage, including a count of news items and the number of minutes of coverage related to particular topics. Information from this database indicates that television coverage in each of the 3 months following the spill included over 150 reports totaling over 900 minutes of airtime on six major national networks, as shown in Figure 4.10-3 below.

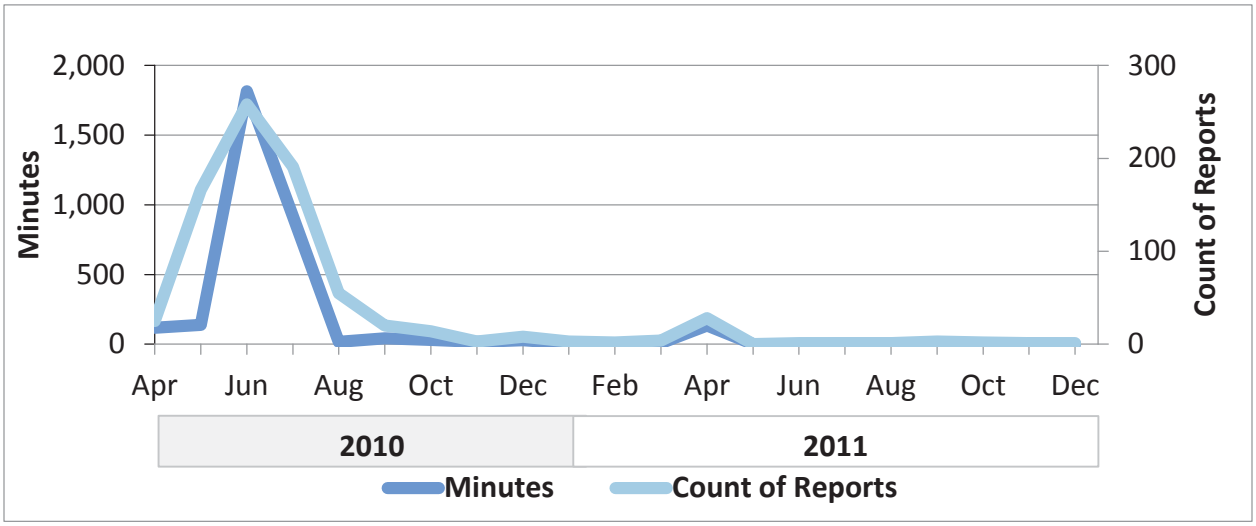

Figure 4.10-3. Television coverage of the oil spill, shown here in minutes and number of reports, helped create a high level of awareness following the spill. Data include ABC, CBS, CNN, FOX, MSNBC, and NBC (Welsh 2015c).

Other information about awareness of the spill was collected in a number of Trustee-directed studies, including the Infield Surveys and the Local and National Coastal Activity Surveys further described in the following section. In the Infield Surveys, over 99 percent[6] of shoreline recreators interviewed reported that they were aware of the oil spill. The Local and National Coastal Activity Surveys also found that over 99 percent of respondents either mentioned the oil spill during the course of the interview or said they had been aware of the spill when asked directly.

4.10.3.2 Impacts on Recreational Activities in the Gulf

Two survey-based investigations conducted by the Trustees provided evidence of the impact of the spill. The Local and National Coastal Activity Surveys measured spill awareness and the potential for spill impacts. The Infield Surveys were used to estimate lost user days, but they also provided supporting evidence of impact through brief onsite surveys of recreational users.

4.10.3.2.1 Evidence from Coastal Activity Surveys

The Trustees implemented two phone surveys in 2011 to collect information on the effects of the oil spill on Gulf Coast recreation. The Local Coastal Activity Survey collected information from residents of Louisiana, Mississippi, Alabama, and Florida. The National Coastal Activity Survey collected information from residents in the remaining contiguous United States.

[6] The actual percentage varied over time and by activity.

In the Local Coastal Activity Survey, about 26 percent of respondents indicated that they had either stopped going to some Gulf Coast sites or had visited them less often because of the oil spill (Welsh 2015c). By extrapolating to the relevant populations, Trustees estimated that the recreation activities of about 2.5 million individuals in the four states surveyed had been affected by the spill.

In the National Coastal Activity Survey, about 10 percent of respondents said they had canceled a planned trip to the Gulf Coast as a result of the spill. By extrapolating to the population covered by the survey, Trustees estimated that about 2.3 million people had cancelled a trip to the Gulf Coast because of the oil spill. Of the subset of respondents who did take trips to the Gulf Coast, 10 percent said that the oil spill had affected their activities during at least one of their trips. By extrapolating to the relevant populations, Trustees estimated that about 1.2 million people had activities during Gulf Coast trips affected by the oil spill.

4.10.3.2.2 Evidence from Infield Surveys

The Trustees also conducted in-person surveys of individuals participating in recreation on the Gulf Coast after the oil spill. Survey respondents were asked whether the oil spill had affected their choice of location to visit and the activities in which they had participated.

A significant percentage of respondents reported that the spill had affected the location they chose and the activities in which they engaged. Typically, the percentage of respondents reporting these impacts was highest in the area ranging west from Gulf County, Florida, to the Louisiana/Texas border and was highest in the summer of 2010 (Welsh 2015c). For example, in July 2010 in this area, about 24 percent of shoreline recreators reported that the spill had affected the location they visited, the activities in which they chose to engage, or their enjoyment of the site they visited. This percentage fell to less than 10 percent by September 2010 and remained in the 0.3 to 7 percent range until the end of May 2013, when the Infield Surveys concluded. Since these surveys were conducted at recreation sites, they do not include any information about people who did not recreate because of the spill.

4.10.3.3 Extent of Injury

4.10.3.3.1 Activities Included in the Assessment

The lost recreational use assessment covered two broad categories of recreation: shoreline use and boating. Shoreline use refers to recreational activities conducted by individuals at locations near beaches and other shoreline areas, and includes swimming, sunbathing, surfing, walking, kayaking, and fishing from the shore or shoreline structures such as piers. It also includes fishing at sites that are considered coastal but are not directly on the beach. Specifically excluded from the shoreline use assessment are recreational boating, commercial activities, and oil spill response.

The second broad category, boating, includes individuals engaged in recreational boating activities that begin at sites providing access to salt water near the Gulf Coast. The term “sites” encompasses a wide variety of locations providing boat access to coastal waters, including marinas, unimproved launches, and private residences. Non-recreational boating activities, including commercial fishing, law enforcement/safety, and oil spill response, are excluded from this category. Figure 4.10-4 illustrates examples of affected shoreline and boating activities.

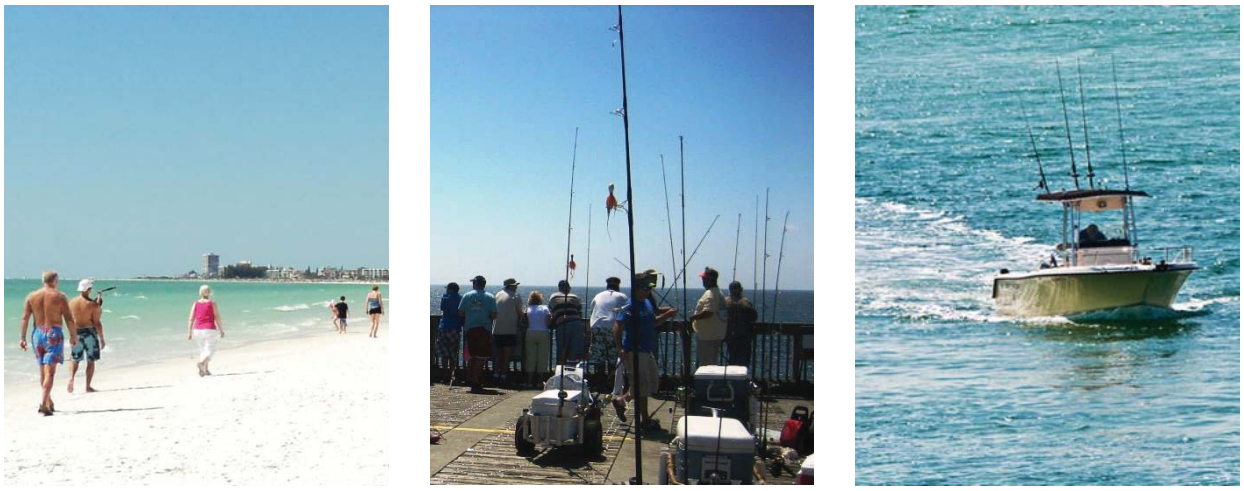

Figure 4.10-4. Beach use, fishing, and boating are examples of activities affected by the spill.

4.10.3.3.2 Activities Investigated but Not Included in the Assessment

Additional recreational activities, including guided hunting, commercially operated diving trips, and nighttime shoreline use, were investigated but not included in the assessment. Discussions with commercial operators of guided hunting and commercial diving ventures suggested some losses may have occurred, but since private business data are often confidential and difficult to obtain, Trustees did not assess these categories of loss. Trustees also did not assess a variety of nighttime shoreline uses that are difficult to measure. While Trustees used existing data to correct for night fishing (McConnell 2015a), non-fishing nighttime beach use was not assessed because of logistical and safety considerations. The fact that potential damages associated with these recreational activities are not included in the estimated total may indicate that the Trustee estimate of lost recreational use is a lower-bound estimate.

4.10.3.3.3 Geographical Extent of Assessment Activities

The oil spill directly affected a wide area of the Gulf Coast. Investigations conducted during and after the spill showed evidence of shoreline oiling from Texas through the Panhandle of Florida. Evidence of oiling was found more than 2 years after the spill. In addition, there was considerable concern that oil could come ashore along the Florida Peninsula. This possibility was identified in a press release provided by NOAA on July 20, 2010. During the spill, there was public awareness and a reasonable expectation that oiling could potentially occur as far south as the Florida Keys (Welsh 2015c).

This information indicated that potential recreational impacts could occur throughout the Gulf Coast from the Louisiana/Texas border to the Florida Keys. Trustees subsequently decided to sample recreation sites within this geographic area. For assessment purposes, the region was divided into the North Gulf (Louisiana/Texas border through Gulf County, Florida) and the Florida Peninsula (Franklin County, Florida, through the Florida Keys), as illustrated in Figure 4.10-5. Due to initial uncertainty on the geographic extent of impacts, the Trustees did not collect primary use data at recreational sites in Texas.

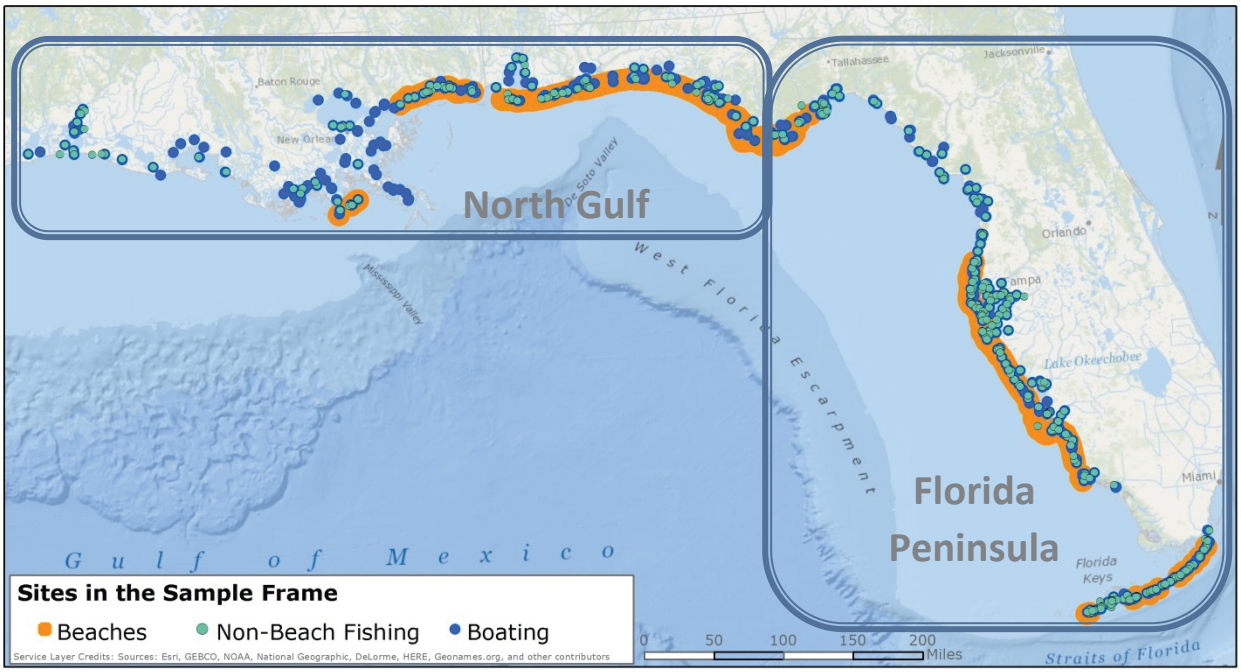

Figure 4.10-5. Trustees sampled a large number of recreation sites across the Gulf of Mexico. Each dot represents a separate site that was included in the sampling.

4.10.3.3.4 Duration of Spill Impact

The spill affected both the quantity and the quality of recreational trips to the Gulf Coast. A remaining critical issue is the time period, or duration, over which the recreational impacts occurred. The responses to the Infield Surveys show an expected pattern: a higher percentage of respondents surveyed in time periods closer to the spill reported impacts of the spill than respondents in time periods more removed from the spill. However, responses also suggested that the duration of the spill impacts could extend beyond the months and locations at which oiling was experienced.

The Trustees determined the duration of spill impacts by observing when recreational use data collected during the assessment (e.g., counts of shoreline users) suggested that recreational activities had returned to pre-spill levels. The impacts of both weather and general economic conditions were considered in evaluating the return to baseline conditions (Tourangeau & English 2015b). Based on this analysis, the Trustees observed that spill impacts for shoreline activities in the North Gulf started in May 2010 and continued through November 2011. In the Florida Peninsula, shoreline impacts started in June 2010 and continued through January 2011. For non-beach saltwater fishing (from piers and other non-beach shoreline areas), the spill impacts started in May 2010 and lasted through March 2011 and occurred only in the North Gulf. Spill impacts on boating (including boat-based fishing) started in May 2010 and lasted through August 2010 and occurred only in the North Gulf (Tourangeau & English 2015b). Figure 4.10-6 summarizes these impacts.

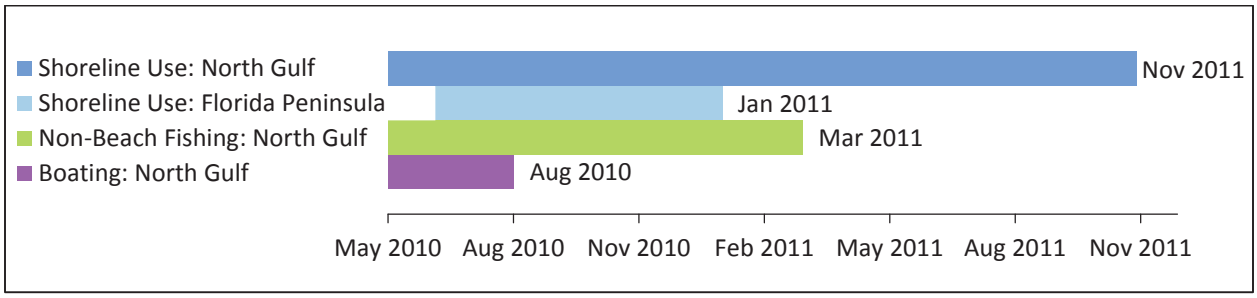

Figure 4.10-6. The duration of losses to recreational use differed depending on the region and activity.

4.10.4 Measurement of Lost User Days

Measurement of lost user days requires a comparison of the number of user days during the spill to the baseline number of user days that would have occurred without the spill. While several data collection efforts on recreational use in the Gulf of Mexico exist (Welsh 2015a), they are not comprehensive enough in space or time to establish a pre-spill baseline or to measure the full extent of losses caused by the spill. The Trustees determined that the best way to measure lost user days was to collect primary data on recreational use from the start of the spill until losses were no longer evident. The Trustees conducted three primary studies to measure the number of lost user days: the Shoreline Study, the Inland Fishing Study, and the Boating Study.

4.10.4.1 Direct Measurement

4.10.4.1.1 Shoreline Study

Trustees measured the number of recreators on sandy beach areas from Grand Isle, Louisiana, through the Florida Keys. Beach user days were estimated using a carefully designed systematic and random sample of overflights, onsite interviews, and onsite counts at 743 predefined beach segments generally less than 1 mile (1.6 kilometers) in length. Overflights were conducted by low-flying airplanes, while onsite interviews and counts were conducted by survey teams on foot.

Overflights of beaches along the Gulf of Mexico were scheduled for half of all weekdays and two thirds of all weekend days over a 3-year period from June 2010 through May 2013. Aerial photographs were taken of almost the entire beach coastline. Analysts used the photographs from each overflight to count the number of people on the beach and in the water for a sample of beach segments. Overflight photographs covered Gulf Coast beaches from Waveland, Mississippi, through Marco Island, Florida. Sampling teams on the ground counted beachgoers at segments in Grand Isle, Louisiana, and the Florida Keys.

Field teams conducted onsite interviews at selected beach segments. The interviewers randomly sampled recreators at preassigned beaches and asked questions about their visit, including the duration of their stay. Onsite count and interview data were collected on about one-fourth of the days selected for overflights. Given the absence of overflights in Grand Isle and the Florida Keys, onsite sampling was conducted more frequently in these locations.

The period of the day covered by interviews and overflights varied by time of year and other factors, but was generally either 7.5 hours or 9.5 hours. Throughout the Shoreline Study, 97,062 people were selected for interviews, with a response rate of 63.5 percent, and 84,687 segment-day pairs were selected for counts, with a response rate of 97.4 percent (Tourangeau et al. 2015b).

4.10.4.1.2 Inland Fishing Study

Trustees estimated the number of recreational anglers at fishing sites along the Gulf of Mexico from western Louisiana through the Florida Keys. Since anglers at sandy beaches were included in the Shoreline Study above, the Inland Fishing Study focused on recreational fishing taking place at non-beach saltwater access points (such as those on bays, inlets, and other tidal areas).

To select a sample of inland fishing sites, Trustees relied on a list of saltwater fishing access sites provided by MRIP. Of the 323 sites on the MRIP list, the sample included 49 sites in the North Gulf and 68 sites in the Florida Peninsula. Infield interview teams visited each sampling site an average of 1 weekday and 1 weekend day every 4 weeks from June 2010 through March 2013. At each site, teams counted the number of recreational anglers and randomly selected individual anglers for interviews. Throughout the Inland Fishing Study, 19,463 people were selected for interviews, with a response rate of 65.1 percent, and 9,202 site-day pairs were selected for counts, with a response rate of 96.4 percent (Tourangeau et al. 2015b).

4.10.4.1.3 Baseline and Shoreline Use Estimates

The Trustees used information from aerial counts and infield interviews to calculate monthly estimates of the number of people on the beaches and at fishing sites throughout the study. These estimates were then adjusted for weather and used to compare the actual level of visitation on the beaches with baseline (the level of visitation that would have occurred, but for the spill). Baseline can be determined by evaluating data on recreational use prior to the spill, or by directly measuring recreational use after observable spill impacts have ended. Trustees evaluated existing data collected by local, state, and national parks and resource management agencies throughout the Gulf of Mexico. While many of these data sources are useful at measuring use at specific sites, they do not provide uniform coverage across the entire Gulf of Mexico or for all years. Trustees thus opted to continue the Infield Surveys beyond the end of spill effects (Tourangeau & English 2015a, 2015b).

Post-spill recreation data were used as the basis for predicting baseline recreational use during the spill; however, weather, economic conditions, and other factors may have caused differences in recreational use across years. Trustees evaluated a number of factors that can affect recreational use and determined that only a weather adjustment was necessary to predict baseline use (Siikamaki 2015; Tourangeau & English 2015b).

The weather adjustment is a statistical procedure that makes the baseline and spill periods comparable. This adjustment ensures that the estimate of lost user days is fully attributable to the spill and does not reflect potential differences in weather.

The difference between the baseline user days and the user days that took place during the spill is the number of lost user days, according to the following equation.

Table 4.10-2 shows estimated shoreline use during baseline and spill conditions, and the resulting lost user days, for the North Gulf and Florida Peninsula.

Table 4.10-2. Estimates of shoreline user days by region. (Standard errors, a statistical measure of uncertainty, are shown in parentheses.)

Spill Period /Region	Estimated Baseline User Days (a)	Estimated User Days During Spill (b)	Estimated Lost User Days (c=a-b)	Percent Decline Due to Spill (d=c/a x 100%)
Jun 2010–Jan 2011				
North Gulf	**14,207,507**	**7,782,270**	**6,425,237**	**45.2%**
	(737,483)	(565,853)	(944,623)	
Peninsula	**17,471,871**	**13,601,695**	**3,870,176**	**22.2%**
	(701,090)	(701,037)	(1,014,982)	
Feb 2011–Nov 2011				
North Gulf	**21,754,732**	**19,580,582**	**2,174,149**	**10.0%**
	(873,894)	(639,215)	(1,068,929)	
Total	**53,434,109**	**40,964,547**	**12,469,562**	**23.3%**
	(1,582,834)	(1,109,725)	(1,894,098)	

4.10.4.1.4 Boating Study

Trustees estimated the number of recreational boaters entering the Gulf of Mexico at sites along the coast from western Louisiana through the Florida Keys. As with the Inland Fishing study, Trustees relied on the MRIP list of saltwater boating access points open to the public. Of the 534 boating sites on the MRIP list, Trustees sampled 103 sites in the North Gulf and 90 sites in the Florida Peninsula. At each selected site, counts and interviews occurred on 1 weekend day and 1 weekday every 4 weeks from June 2010 through August 2012.[7] Throughout the Boating Study, 65,556 people were selected for interviews, with a response rate of 83 percent, and 11,488 site-days were selected for counts, with a response rate of 91.7 percent (Tourangeau et al. 2015b).

Table 4.10-3 shows estimated boating use during baseline and spill conditions, and the resulting lost user days, from the Boating Study.

Table 4.10-3. Estimates of boating user days. (Standard errors are shown in parentheses.)

Spill Period /Region	Estimated Baseline User Days (a)	Estimated User Days During Spill (b)	Estimated Lost User Days (c=a-b)	Percent Decline Due to Spill (d=c/a x 100%)
Jun 2010 – Aug 2010	**759,605**	**544,231**	**215,374**	**28.4%**
North Gulf	(53,556)	(49,880)	(72,944)	

[7] Sampling ended in June 2012 in the Florida Peninsula.

4.10.4.2 Adjustments for Coverage

The Shoreline, Inland Fishing, and Boating Studies provide reliable estimates of lost recreational use for the majority of times and geographical areas where spill impacts occurred. The coverage of these studies, however, does not include all relevant months, places, and times of day impacted by the spill. To address missing coverage, the Trustees performed a number of targeted supplemental analyses.

4.10.4.2.1 Early Data Collection

The primary Shoreline, Fishing, and Boating Studies were not fully implemented by the Trustees until June of 2010. In order to evaluate impacts to recreation in the weeks immediately following the spill but before the full studies were implemented, Trustees collected information at selected boating, fishing, and beach sites during May of 2010 (English 2015a). An additional 1,572,845 lost shoreline and 72,871 lost boating user days were added to the estimates from the primary studies to account for May 2010.

4.10.4.2.2 Supplemental Shoreline Study

The daily coverage of the primary Shoreline Study began at 10 a.m. and ended between 5:30 and 7:30 p.m., depending on location and time of year. The Trustees conducted a supplemental study to account for shoreline recreational use occurring during daylight hours outside of these time limits. Averaged over 2010 and 2011, the resulting adjustment factor increased the estimate of user days by 5.0 percent in the North Gulf and 18.9 percent in the Florida Peninsula (English 2015c). An additional 1,234,821 lost user days were added to the estimate from the primary studies.

4.10.4.2.3 Backyard Boating

The primary boating study did not include coastal waterfront residences or private marinas inaccessible to the public (or what is termed "backyard boating"). To capture boating user days originating from these locations, the Trustees performed a survey of registered boat owners in counties near coastal areas in Louisiana, Mississippi, Alabama, and Florida (Lupi 2015). The Trustees estimated that the spill resulted in a loss of 22,895 backyard boating user days.

4.10.4.2.4 Night Fishing

Neither the primary Shoreline and Inland Fishing Studies nor the supplemental shoreline study covered fishing at night. To correct for this undercoverage, the Trustees developed an adjustment factor that they applied to the estimates of lost fishing user days in the Shoreline and Inland Fishing Studies. The adjustment was based on data obtained from MRIP's Coastal Household Telephone Survey, which includes estimates of hourly fishing activity in the Gulf of Mexico over a 24-hour period (McConnell 2015a). Using this approach, an additional 152,517 lost user days were added to the estimate from the primary studies.

4.10.4.2.5 For-Hire Fishing

The estimates of lost user days from the primary studies explicitly excluded any boat-based trips that individuals take for a fee, such as for-hire boat fishing. The Trustees relied on data collected by MRIP to estimate lost user days associated with for-hire boat fishing (McConnell 2015b). An additional 216,089 lost user days for for-hire fishing were added to the estimate from the primary studies.

4.10.4.2.6 Federal Lands Outside of Sample Area

The primary Shoreline Study did not include estimates of losses at Ship Island, Fort Barrancas, and Advanced Redoubt, all of which are part of Gulf Islands National Seashore. These sites were excluded from the primary studies for logistical reasons. Data available from the National Park Service was used to measure spill impacts at these sites, resulting in an additional 23,276 lost user days (English 2015b).

4.10.5 Measurement of Value

To determine the total recreational losses, the Trustees had to measure the value of a lost user day. The Trustees estimated this value using the travel cost method, a technique that is common in the economics literature and is frequently applied in damage assessments (Herriges 2015). Travel cost valuation models were used to calculate the average value of a lost user day specific to the time periods and activities described in Table 4.10-2 and Table 4.10-3. While these user day values were applied specifically to lost user days, they incorporate value from all three types of responses to the spill described at the beginning of this section: lost trips, substitute trips, and diminished-value trips. Multiplying the number of lost user days by the value of a lost user day provides an estimate of the total recreational losses.

4.10.5.1 Valuation Surveys

The Trustees implemented two separate general population surveys to gather the data for the valuation models. The Local Valuation Survey targeted adults living in Louisiana, Mississippi, Alabama, Florida, and selected counties in Texas and Georgia (Lupi & Welsh 2015). The National Valuation Survey targeted adults living in the contiguous 48 United States, excluding the states and counties targeted in the Local Valuation Survey (Welsh 2015b). Both the Local and the National Valuation Surveys gathered data on respondents' recreation trips and demographic characteristics. Trustees received 296,842 completed mail surveys and conducted 43,335 follow-up telephone interviews during the course of the two valuation surveys. Figure 4.10-7 illustrates the sample areas for the two surveys.

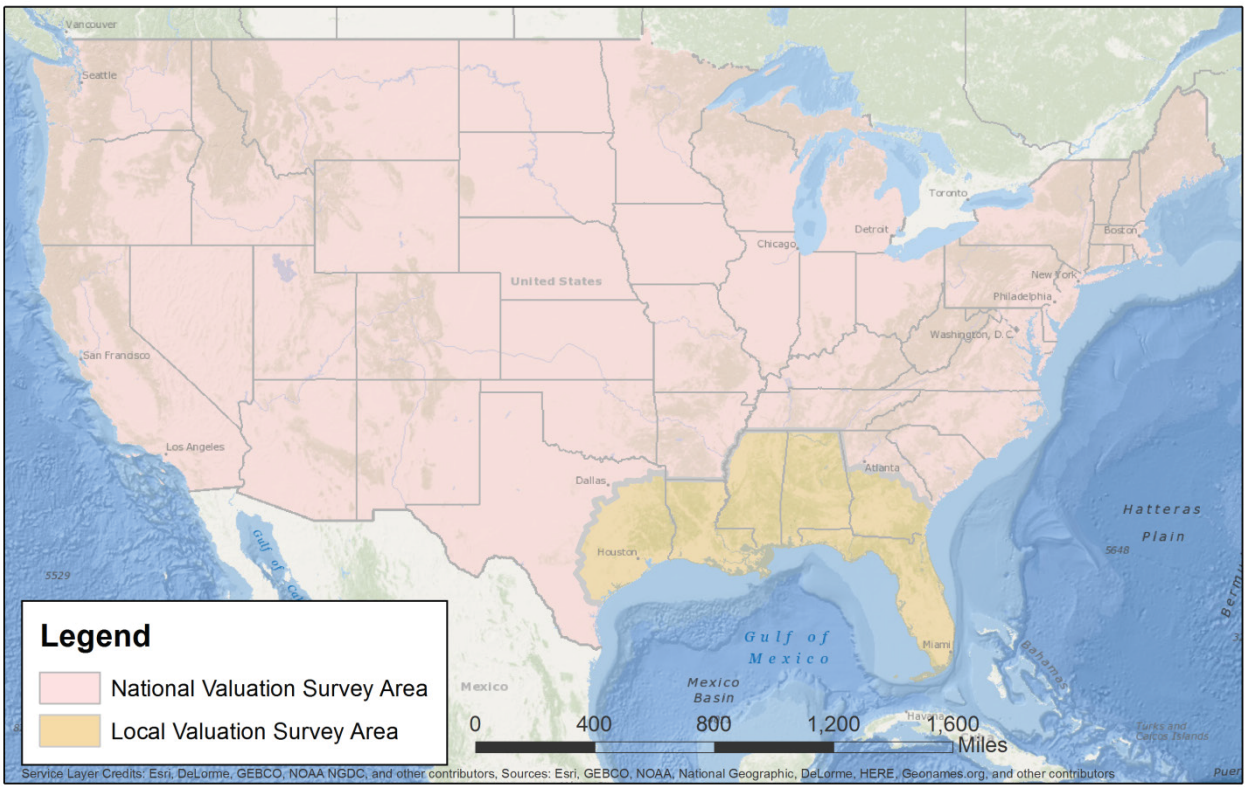

Figure 4.10-7. Trustees used two different valuation surveys covering the entire contiguous 48 United States to learn about people's trips to the Gulf of Mexico.

The National Valuation Survey was a combination mail and telephone survey that was implemented during 2012 and 2013. The telephone survey gathered data on all recreation trips to coastal areas of the United States that included a stay of 2 or more nights. Respondents to the National Valuation Survey reported their activities for a period covering 6 to 8 months prior to the interview.

The Local Valuation Survey was also a combination mail and telephone survey implemented during 2012 and 2013. The Local Valuation Survey, however, differed from the National Valuation Survey primarily by:

- Focusing exclusively on recreation trips taken within the Gulf Coast region, defined as coastal areas from Texas to Georgia.
- Requesting data on trips regardless of length, including single-day trips.
- Gathering data on boating trips separately from shoreline trips.
- Requesting trip data for only a 2- to 4-month period prior to the interview (Lupi & Welsh 2015; Welsh 2015b).

The Trustees combined data from both surveys to estimate the shoreline recreation valuation model. The boating valuation model only used data from the Local Valuation Survey, since the majority of private boating trips to the Gulf Coast originate from adjacent states.

4.10.5.2 Valuation Model Structure

When an event, such as an oil spill, occurs that reduces the quality of recreation at certain sites, a valuation model can be used to evaluate the impact of that event on recreation trips. As described previously, some of these trips will be diverted to alternative destinations, some trips will be canceled, some will be diminished in quality due to the event, and some may be unaffected. The valuation model converts all of these impacts to dollar values using baseline information about individuals' willingness to travel farther—and thereby incur additional costs—to avoid lower quality sites.

Two valuation models were used: one for all shoreline activities, including fishing; and another for boating. These models provide a quantitative description of people's recreation behavior. For example, the shoreline model describes the total number of recreation trips from throughout the contiguous United States to 83 shoreline areas in Texas, Louisiana, Mississippi, Alabama, Florida, and Georgia's Atlantic coast. The boating model describes boating trips to 67 sites in the same geographic area, but only includes trips originating in those six states.

For a given individual, recreation choices depend on demographic characteristics, the cost of traveling to the available recreation sites, and the quality of the available recreation sites. Trustees obtained data on shoreline recreation trips and demographic characteristics from the Local and National Valuation Surveys. The cost of traveling to recreation sites was calculated based on a combination of out-of-pocket costs (e.g., gasoline, depreciation, airline tickets) and the value of time spent traveling. Information about the relative quality of available recreation sites was determined within the model based on the relative number of trips and distances people travel to available sites.

The Trustees used the valuation models to determine the lost value per lost user day due to the spill (Herriges 2015). In each model, the Trustees simulated an event that led to a decline in the quality of all affected recreation sites. The magnitude of this event was carefully calibrated so that the overall percentage reductions in trips to the North Gulf and Florida Peninsula sites matched the percentage decline in user days due to the spill measured through the overflights and Infield Surveys (i.e., the percentages in Table 4.10-2 and Table 4.10-3). The model was then used to estimate the lost value associated with this calibrated event. The estimated loss incorporates lost, substituted, and diminished-value trips due to the event. The total loss in value estimated by the model was then divided by the number of the lost user days, resulting in an estimate of lost value per lost user day. For the shoreline model, the value per lost user day was $36.25, representing an average of all activities included in the shoreline model and over the two different periods of loss. For the boating model, the average value per lost user day was $16.20.

4.10.5.3 Fixed Costs of Boating

The valuation model developed for recreational boating, like most travel cost models, estimates people's willingness to pay for the opportunity to take boating trips net of any costs incurred to maintain a boat. However, there are also substantial fixed costs involved in boat ownership and maintenance. Because an oil spill involves transient impacts to recreation, boaters would not be expected to sell their boats in response to the spill. It is, therefore, not appropriate to net out the fixed costs associated with boat ownership. To obtain a more complete estimate of boating losses, however, the cost of owning a boat must be added to the lost value estimated by the boating valuation model

(English & Lupi 2015). Therefore, the Trustees divided the total annual fixed costs by the total annual number of saltwater boating days in the Boating Survey to obtain a per-trip increment of value of $7.90. Adding this amount to the average value per lost user day from the valuation model of $16.20 resulted in a total value per lost user day of $24.10.

4.10.5.4 Damages in Texas

Due to uncertainty about the potential for recreation impacts in Texas, the Trustees did not collect infield data at Texas sites. Although subsequent evaluation of existing data indicated that recreational use losses likely did occur in Texas, those data were not sufficient to generate a primary estimate of lost recreational use damages. Instead, the Trustees used information from the Local and National Coastal Activity Surveys to roughly evaluate potential lost recreational use in Texas. Results indicate that approximately 876,865 recreation trips to coastal sites in Texas were canceled due to the spill. Using the average lost value per lost user day calculated from the valuation surveys, damages may be approximately $31.8 million. This is the Trustees' best estimate of damages in Texas (Welsh & Horsch 2015).

4.10.6 Estimate of Damages

The Trustees calculated lost recreational use damages for a given period, activity, and region by multiplying the number of lost user days estimated from the Infield Surveys (with adjustments to coverage) by the value per lost user day measured by the valuation surveys (McConnell & English 2015). This calculation is summarized in the following equation.

Since damages occurred over time, the Trustees made two additional adjustments to represent damages in present value terms. Damages were adjusted for inflation from 2013, the year of data collection for the valuation surveys, to the current year. Damages were also compounded to account for the period between the date of injury and the present. Losses accrue interest at the rate of 3 percent per year and inflation is accounted for using the Consumer Price Index.

The damages exhibit statistical uncertainty due to sampling. The Trustees calculated the precision of estimates for the primary Shoreline and Boating Studies, but not for the subsequent adjustments to coverage. Table 4.10-4 shows the results of the primary studies.

Table 4.10-4. Estimates of damages due to lost shoreline and boating user days.

Damages (2015)	Lower Limit	Point Estimate	Upper Limit
Primary Shoreline Study	$354.23 million	$519.81 million	$685.38 million
Primary Boating Study	$1.01 million	$4.04 million	$7.06 million

The point estimate is the Trustees' best estimate of damages from the spill. Uncertainty in this estimate is represented by the upper and lower limits of approximate 95 percent confidence intervals.[8]

Table 4.10-5 shows additional losses based on the adjustments for missing coverage. It was not possible to estimate confidence intervals for these additional amounts, so they are added as fixed components to the lower limit, upper limit, and point estimates of total damages from Table 4.10-4.

Table 4.10-5. Damages from adjustments to coverage of primary studies.

Category	Source	Damages (2015)
Early Data Collection	Lost user days in May 2010 for shoreline activities, inland fishing, and boating.	$66,810,561
Supplemental Shoreline Study	Lost user days for shoreline activity outside of regular sampling hours.	$51,191,963
Backyard Boating	Lost user days for boating launched from private residences.	$429,994
Night Fishing	Lost user days for fishing outside sample period.	$6,357,177
For-Hire Fishing	Lost user days as measured through the MRIP for-hire fishing survey.	$9,003,910
Federal Lands Outside of Sample Area	Lost user days as measured using National Seashore visitation data.	$952,371
Fixed Costs of Boating	Underestimate of value due to fixed costs incurred in boating: incremental addition to the value per lost boating trip.	$2,848,632
Damages in Texas	Lost user days estimated from self-reported canceled trips.	$31,790,272

Table 4.10-6 presents total damages, incorporating results of the primary studies, adjustments to coverage, and damages in Texas.

Table 4.10-6: Total lost recreational use damages. (Numbers may not sum to totals due to rounding)

Damages (2015)	Lower Limit	Point Estimate	Upper Limit
All damages	$527.6 million	$693.2 million	$858.9 million

In the assessment, the Trustees examined a variety of uncertainties for their potential impact on damages. Some potential adjustments increase damages, others decrease damages. Memoranda included in the Administrative Record summarize the analyses of these sensitivities (Tourangeau et al. 2015a; Von Haefen et al. 2015).

[8] An approximation of the 95 percent confidence interval for this estimate is derived by adding a point estimate for the Tier 2 subset of total recreational use damages to the upper and lower 95 percent confidence interval of the Tier 1 recreational use damages, recognizing that the statistical uncertainty of the Tier 2 estimates is unknown.

In conclusion, the DWH oil spill resulted in a loss of recreational value. The Trustees estimate that 16,857,116 user days were lost, and these trips would have occurred along the coasts of Texas, Louisiana, Alabama, Mississippi, and Florida. The effects of the spill impacted recreation in the Gulf of Mexico as late as November 2011. In total, the Trustees estimate that the public lost $693.2 million (with uncertainty ranging from $527.6 million to $858.9 million) worth of recreational value as a result of the spill.

4.10.7 Conclusions and Key Aspects of the Injury for Restoration Planning

Impacts from the DWH oil spill, including oiled shorelines and closing of areas to recreation, resulted in losses to the public's use of natural resources for outdoor recreation, such as boating, fishing, and going to the beach.

The Trustees considered all aspects of the lost recreational use injury assessment in restoration planning to offset the losses, including:

- Spill impacts for shoreline activities in the North Gulf lasted for many months, starting in May 2010 and continuing through November 2011.
- Recreational losses due to the spill affected sites in the states of Texas, Louisiana, Mississippi, Alabama, and Florida. Residents throughout the contiguous United States were included as part of the affected public.
- The Trustees conducted a number of studies to measure the lost recreational value to the public due to the spill. The Trustees estimated that 16,857,116 boating, fishing, and other shoreline activity user days were lost throughout the five affected states. Total recreational use damages due to the spill are estimated to be $693.2 million with uncertainty ranging from $527.6 million to $858.9 million.

As described in Chapter 5 (see Section 5.5.14), the Trustees have identified a portfolio of restoration approaches for these injuries. These approaches include increasing recreational opportunities, improving habitats used for recreation, and using education and outreach to promote engagement in restoration and stewardship of natural resources.

4.10.8 References

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