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Estimating the value of lost recreation days from the Deepwater Horizon oil spill

Eric English [a], Roger H. von Haefen [b], Joseph Herriges [c], Christopher Leggett [d], Frank Lupi [c, *], Kenneth McConnell [e], Michael Welsh [f], Adam Domanski [g], Norman Meade [h]

[a] Bear Peak Economics, United States
[b] North Carolina State University, United States
[c] Michigan State University, United States
[d] Resource Systems Group, United States
[e] University of Maryland, United States
[f] Independent Consultant, United States
[g] ECONorthwest, United States
[h] National Oceanic and Atmospheric Administration, United States

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ABSTRACT

The 2010 Deepwater Horizon oil spill in the Gulf of Mexico was the largest ever in U.S. waters, eclipsing the 1989 Exxon Valdez spill in terms of the sheer quantity of oil released and the scale and scope of activities impacted. We developed a recreation demand model to monetize economic damages associated with lost shoreline recreational user days attributable to the spill. The unprecedented magnitude of the spill disruption led to a variety of innovations. We estimate a model of shoreline recreation trips to the Gulf Coast region from the general population of the contiguous U.S., combining single and multiple-day trips, calculating travel costs that incorporate detailed information on flying costs and transportation mode choice, and using alternative-specific constants to control for site characteristics. Losses per recreational user day are assessed using utility adjustments that reproduce the decline in recreation observed through onsite counts. Sensitivity analyses demonstrate our lost user day value is robust to changes in income imputation, nesting structure, site aggregation and spill calibration, and show the importance of accounting for flying as a mode choice. Estimated losses from the primary shoreline study are $520 million (±166) out of the total recreational damages of $661 million (2015$).

1. Introduction

On April 20, 2010, BP's Deepwater Horizon (DWH) drilling rig exploded and later sank 50 miles off the Louisiana shore. The accident killed eleven workers and caused a massive oil spill in the Gulf of Mexico. For the next 87 days, oil billowed

* Corresponding author. Michigan State University, Department of Agriculture, Food, and Resource Economics, 446 W. Circle Dr, Room 202, East Lansing, MI 48824.

E-mail addresses: eric.english@bearpeakeconomics.com (E. English), rhhaefen@ncsu.edu (R.H. von Haefen), jah@msu.edu (J. Herriges), chris.leggett@rsginc.com (C. Leggett), lupi@msu.edu (F. Lupi), tmcconn@umd.edu (K. McConnell), welsh@mailbag.com (M. Welsh), domanski@econw.com (A. Domanski), norman.meade@noaa.gov (N. Meade).

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continuously out of damaged drilling equipment. A U.S. District Court's finding of fact later concluded that 134 million gallons of oil were released (U.S. v. BP et al., 2015), making the DWH spill the largest ever in U.S. waters and an order of magnitude larger than the 1989 Exxon Valdez spill. Oil from the DWH spill washed ashore on beaches and tidal marshes in Texas, Louisiana, Mississippi, Alabama, and Florida. National Oceanic and Atmospheric Administration (NOAA) models also predicted during the spill that the oil might reach Florida's Atlantic Coast and Keys. The spill was the most closely followed news item in the U.S. throughout the late spring and summer of 2010 (Pew Research Center, 2010; Welsh, 2015).

Within days of the spill, NOAA's Office of Response and Restoration initiated efforts to assess recreation-related welfare losses under the authority of the Oil Pollution Act of 1990 (OPA). NOAA assembled a team of economists and survey experts who worked for five years to assess these losses. The effort dwarfed past recreational assessments, launching eight separate surveys and costing tens of millions of dollars. The final estimate of recreation damages was $661 million. This paper describes the assessment of lost shoreline recreation, with emphasis on the shoreline valuation model.

Under OPA, responsible parties are required to restore, rehabilitate, replace or acquire the equivalent natural resources and/or services to what was lost. Full recovery can take years, and the public suffers losses while resources are diminished. These “interim losses” are compensable as part of a natural resource damage assessment (NRDA) and pursuable by natural resource trustees on the public's behalf. Our assessment of recreation losses was conducted on behalf of NOAA and other federal and state trustees, and represents a significant component of lost-use values arising from the Gulf oil spill. Given this focus, we did not measure other lost-use values such as lost consumer surplus from seafood consumption. We also did not measure private losses such as property value impacts[1] or losses to commercial fishing enterprises, hotels and other businesses. Nonuse losses to the public were included in a separate assessment (Bishop et al., 2017).

To monetize the lost interim recreational use value of the spill, we developed a comprehensive strategy involving primary data collection and demand modeling grounded in neoclassical welfare economics. Our damage assessment employed two sources of data that are unprecedented in their scale and scope for a study of recreation value: 1) infield surveys of recreational activity on site, comprised of aerial photographs and ground counts and interviews; and 2) telephone surveys of adults in the lower 48 states. The infield surveys are comprised of 129,000 in-person interviews, 35,000 onsite counts and nearly 500,000 aerial photographs, conducted for three years beginning May 2010. They are the basis for estimating the number of recreation user days in the Gulf coast area by year, month and region, from May 2010 through May 2013, that is, during and after the spill impact. This permits estimation of lost user days due to the spill by year, month and area (Tourangeau et al., 2017). The phone surveys, based on samples of adults in the lower 48 states, include 244,000 mail survey screeners and 43,000 telephone interviews. The surveys gather information on recreational trips to the Gulf area after the spill impact has passed. They form the basis for estimating the shoreline recreational demand model for sites in the greater Gulf of Mexico. Damages are calculated as the product of lost user days – estimated using the infield surveys – and the value of a lost user day – estimated using the phone survey data.

The disruption to recreation generated by the DWH spill led to a variety of challenges that were addressed in our approach for assessing losses. Recreation sites along the entire Gulf of Mexico faced potential impacts that lasted several months or longer, and many of these sites were popular destinations for visitors from throughout the U.S. The standard travel cost model focusing only on day trips from the local region (e.g., Parsons et al., 2009; Lew and Larson, 2008) would have been inadequate for assessing the impact of a disruption of this scale. Faced with the challenges of creating a national demand model with a large geographical area of sites, we developed a series of innovations that should have lasting significance for recreational demand modeling. We estimate a model of shoreline recreation trips to the Gulf Coast region from the lower 48 states, combining single and multiple-day trips, calculating travel costs that incorporate detailed information on driving costs, flying costs and transportation mode choice, and using alternative-specific constants (ASCs) to control for site characteristics. The extent of the market and scope of impacted sites make the model unique. In addition, the demand model is estimated using data collected after the recreational impacts of the spill had dissipated, and the spill-induced demand shift is determined by calibrating the model to the estimates of lost user days from the infield counts. This approach improves upon Hausman et al. (1995), where declines in recreation were based solely on survey responses, and Stratus Consulting (2010), where declines in recreation were based on survey responses to estimate a percentage decline in recreation that was then applied to total counts from onsite surveys.

Past oil spills have played an important role in the field of environmental valuation. Efforts to assess nonuse values lost from the 1989 Exxon Valdez disaster (Carson et al., 1992, 2003), for example, led to an enduring debate about the measurement of those values (Portney, 1994; Diamond and Hausman, 1994; Kling et al., 2012). The Exxon-funded study assessing use value losses from the Valdez spill (Hausman et al., 1995) was an early application of a combined site choice and participation model to recreational trip data. The assessment of recreational use losses after the 2007 Cosco Busan oil spill in San Francisco Bay (Stratus Consulting, 2010) was one of the first to combine telephone surveys with onsite counts to assess losses from a decline in environmental quality.

The DWH spill, affecting popular beaches and fishing sites throughout the Gulf of Mexico, has likewise attracted considerable attention from resource economists. Several recently published studies have explored spill-related welfare

[1] A concern with incorporating declines in property values in our damage assessment is that these losses would in part capture recreation losses which should be capitalized into the value of the housing stock. Thus, simply adding recreation and property value losses together would represent a form of double counting.