

# Valuing Beach Closures in Damage Assessment: An Application to the Texas Gulf Coast

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November 14, 2007  
Clean Gulf Workshop  
Tampa, FL



## Acknowledgement

Funding for this project was provided by  
the Coastal Response Research Center  
[www.crrc.unh.edu](http://www.crrc.unh.edu)



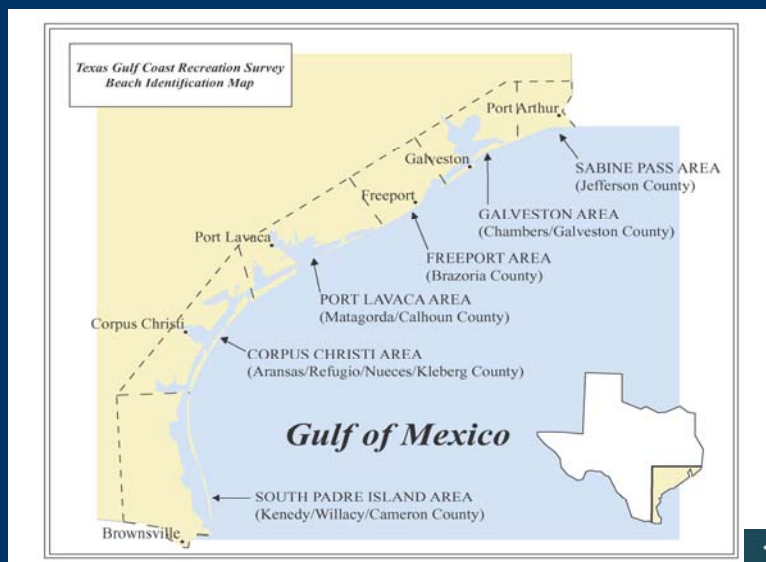
## Purpose & Method

- **Purpose**
  - Value beach closures for damage assessment
  - Monetary and Non-Monetary Terms
  - Apply to Texas Coast with focus on Padre Island National Seashore
- **Method**
  - Random Utility Model
  - Infer Values from observed behavior

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## Study Area



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## Household Survey

- Phone-Mail-Phone Survey of Beach Use
- N = 884
- Monthly from May - September
- Stratified
- Trip data
- Demographic data

Variable	Mean or % of Sample (Adjusted for Stratification)
Age	41 years
Yes/No Dichotomous Variables:	
Work Fulltime	62%
Children Over 17	49%
High School	32%
College	24%
Graduate School	10%
Retire	9%
Spanish	9%
Female	60%
Own a Boat	24%
Own a Pool	24%
Own Fishing Equipment	49%
Own Property Near Coast	7%

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## Stratification

QuickTime™ and a decompressor are needed to see this picture.

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## Trip Frequencies

Number of Trips	Percent (Adjusted for Stratification)
1	41%
2	24%
3	9%
4	7%
5	6%
6	3%
7	3%
> 7	7%

Travel Mileage	Percent (Adjusted for Stratification)
Less Than 5 Miles	8%
5 - 20	11%
21 - 30	11%
31 - 50	17%
51 - 100	34%
100 - 150	5%
150 - 300	13%
Greater Than 300 Miles	1%

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## The Beaches

- 65 Beaches & Characteristic Data
- Field Trip, State Access Guide, Interviews

QuickTime™ and a decompressor are needed to see this picture.

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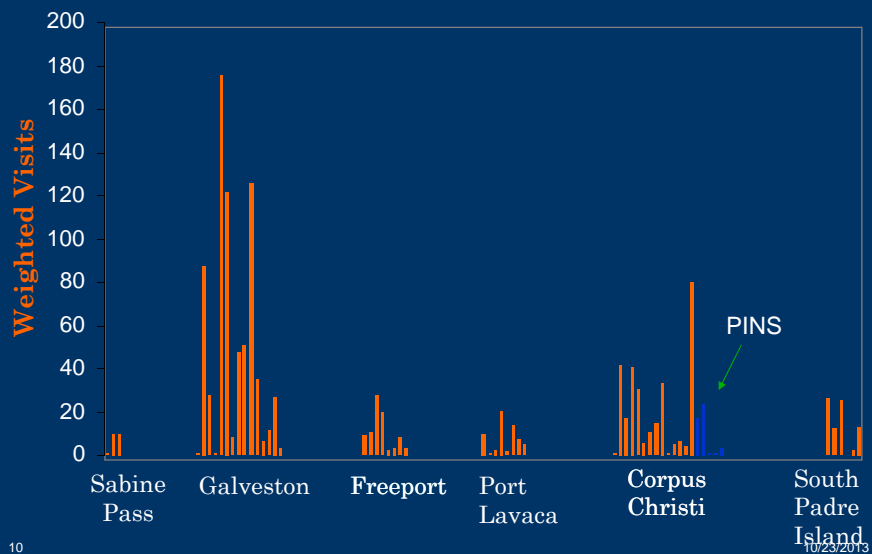
## Beach Characteristic Data

Site Variables	Mean or % of Beaches
Beach length (mileage)	5.35
<b>Dichotomous Yes/No Variables:</b>	
Gulf access	Beach is located on the gulf (not bay) 74%
State park	Beach is part of a state park 6%
Remote	Beach has a remote location 34%
Vehicle free	Vehicles not allowed on beach 40%
Manual cleaning	Beach is routinely manually cleaned 51%
Machine cleaning	Beach is routinely machined cleaned 55%
Rest room	Restrooms located at beach 57%
Lifeguards	Lifeguards at beach 26%
Concession	Concession located at beach 23%
No fishing	Not listed as a fishing area in 2002 Texas Beach & Bay Access Guide 5%
No swimming	Not listed as a swimming area in 2002 Texas Beach & Bay Access Guide 9%
Red tide history	Beach has a recent history of red tide 18%
Advisory/Closure history	Beach has a recent history of closures and/or advisories 17%

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## Beach Visits by Beach



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10/23/2013

## Random Utility Model (Or Choice Model)

Each person has a trip utility for each site ( $i$ ) and a no-trip utility in each choice occasion in the season:

$U_i(x_i, y; \beta, \varepsilon_i)$  ~ site utility ( $i = 1, \dots, 65$ )

$U_0(y)$  ~ no trip utility

$x_i$  ~ vector of site characteristics

$y$  ~ vector of individual characteristics

$\beta$  ~ parameter vector to be estimated

$\varepsilon_i$  ~ error term

Individuals are assumed to have chosen site with the highest utility. So an individual chooses site  $k$  if

$$U_k(x_k, y; \beta, \varepsilon_k) > \{U_0(y; \beta, \varepsilon_0) \text{ and } U_{m_i}(x_{m_i}, y_{m_i}; \beta, \varepsilon_i) \text{ for all } i\}$$

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## Estimation

From the researcher's perspective the choice of site is a stochastic event with probability

$$pr\{k\} = pr\{U_k(x_k, y; \beta, \varepsilon_k) > [U_0(y; \beta, \varepsilon_0) \text{ and } U_i(x_i, y; \beta, \varepsilon_i) \text{ for all } i]\}$$

Under carefully chosen assumptions about the distribution of the error terms one get closed form expressions for the probability. The most well know being the logit form

$$pr\{k\} = \frac{U_k(x_k, y; \beta)}{U_0(y; \beta) + \sum_i U_i(x_i, y; \beta)}$$

Form likelihood function and choose parameters to maximum its value

$$\Gamma(\beta) = \prod_{n=1}^{884} \prod_{i=0}^{65} \prod_{t=1}^{150} \left\{ \frac{U_{knt}(x_{i,t}, y_{m,t}; \beta)}{U_{0nt}(y; \beta) + \sum_{int} U_{int}(x_{i,t}, y_{m,t}; \beta)} \right\}^{R_{knt}}$$

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## Welfare Analysis

Once estimated we can retrieve the parameters from the model and form an expression for the expected utility of a choice occasion. A common form (again from the logit) is

$$EU = \log(U_0(y_i; \beta) + \sum_{i=1}^{65} U_i(x_i; \beta))$$

To evaluate site closures we consider this expression with all sites included and Padre (or other sites) exclude

$$\Delta W = \log(U_0(y_n; \beta) + \sum_{i=1}^{65} U_i(x_i; \beta)) - \log(U_0(y_n; \beta) + \sum_{i=1}^{59} U_i(x_i; \beta)) / \beta_n$$

↑ Padre Sites Closed  
↑ Marginal Utility of Income

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## Coefficient Estimates

Variable	Coefficients	
	Estimate	t-statistic
<b>Site Characteristics (site utility):</b>		
<i>Trip Cost</i>	-.03	-26.9
<i>Trip Time</i>	-.13	2.08
<i>Trip Time * Income</i>	-.005	3.74
<i>Log Length</i>	.23	5.96
<i>Gulf access</i>	.42	2.89
<i>State park</i>	.05	0.22
<i>Remote</i>	-.25	2.16
<i>Vehicle free</i>	.49	3.72
<i>Manual cleaning</i>	.47	3.71
<i>Machine cleaning</i>	.91	8.30
<i>Rest room</i>	.45	3.96
<i>Lifeguards</i>	.29	2.44
<i>Concession</i>	-.46	4.39
<i>No fishing</i>	-.14	1.15
<i>No swimming</i>	-.62	2.56
<i>Red tide history</i>	-.92	4.18
<i>Advisory/Closure history</i>	-.60	-3.59
<i>May*Padre</i>	1.28	2.42
<i>June*Padre</i>	1.91	4.14
<i>July*Padre</i>	2.88	7.09
<i>August*Padre</i>	.96	1.61
<i>Sept*Padre</i>	2.95	5.89
<b>Individual Characteristics (no-tip utility):</b>		
<i>No-Trip Constant</i>	5.22	10.49
<i>Weekend</i>	-1.20	19.82
<i>Kids</i>	-.09	1.46
<i>Log Age</i>	.34	3.22
<i>Retired</i>	-.15	1.10
<i>Spanish</i>	-.22	2.22
<i>High School</i>	.17	2.18
<i>College</i>	-.10	1.21
<i>Graduate Schdo</i>	-.30	2.81
<i>Full Time Job</i>	-.15	2.17
<i>Female</i>	.09	1.51
<i>Cottage</i>	-.24	2.29
<i>Boat</i>	-.35	5.21
<i>Pool</i>	.30	3.89
<i>Fishing Equipment</i>	-.07	1.17
<i>June</i>	.15	1.82
<i>July</i>	.28	3.16
<i>August</i>	.20	2.15
<i>September</i>	.95	8.07

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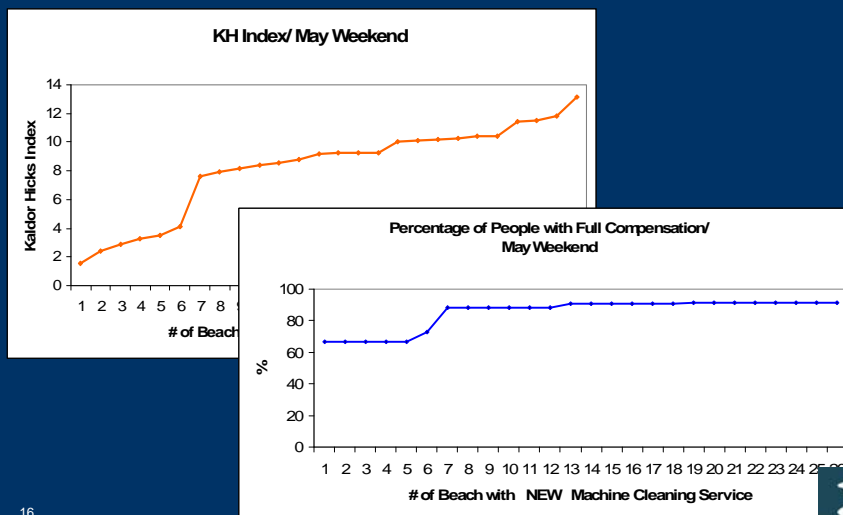
## Welfare Estimates

Loss of Six Padre Beaches Per Day	Total Loss	Per Trip Loss	Number of Trips Displaced
<i>Weekday</i>			
May	\$35,669	\$28	1,290
June	62,503	28	2,224
July	165,063	29	5,645
August	18,910	27	694
September	93,454	29	3,212
<i>Weekend</i>			
May	\$109,514	\$28	3,930
June	192,542	28	6,776
July	503,628	30	16,799
August	58,970	27	2,154
September	295,733	29	10,012

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## Non-monetary Compensation



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