Multinomial Logit for Coastal Recreational Choice in Elmer's Island, Louisiana

NIRMALA DEVKOTA
KRISHNA P. PAUDEL
REX H. CAFFEY
LARRY M. HALL
Department of Agricultural Economics and Agribusiness
Louisiana State University
Baton Rouge,
Louisiana, USA

Abstract

We used multinomial logit models to find the factors determining the choice of a visit to Louisiana coasts. Our study shows that, if individual's primary purpose of trip is not only the costal recreations, then they are more likely to choose camping in Louisiana coasts. Similarly, bird watching is popular among those individuals, who visit the coast on the way of other goals. More flexible hours increases the probability of surf fishing reducing the likelihood of offshore fishing. Individuals, who give higher values to importance of environmental quality of the sites, are less likely to choose swimming. However, the individuals giving more value to physical characteristics of the site are more likely to choose camping. The result also states that increase in amount of time that an individual spend on coastal recreation increases the probability of choosing camping or surf fishing. Negative marginal effect of income for camping says the wealthier individual would not choose overnight camping. Finally, marginal effect of gender dummy (1=female) is negatively related to surf fishing and positively related to swimming and bird watching. The elasticity estimate shows that environmental characteristics of the site has the highest negative effect suggesting that the environmental characteristic of site is very important on recreational choice decisions.

Introduction

Multinomial logit model which depends on individual as well as the site characteristics while choosing a site or activity from set of alternatives can be used to determine the factors determining the choice of alternative uses of a recreational site. Multinomial logit estimation reflects the recreational decision based on the utility that consumer obtains from the particular trip that he/she chooses to make. This kind of choice models are derived from the utility maximization hypothesis. This hypothesis assumes that the decision maker's choice is the result of their preference. The decision maker selects the alternative with the highest preference or utility. The derived utility from a trip is considered to be a function of the expected quality of a trip. Choice of a recreation is assumed to be dependent on the attributes of sites and individual consumer's preference behavior. The quality of trip is measured in terms of characteristics of the available recreational choices and individuals such as income, recreational expenditure for visiting the alternative. The utility that a decision maker links with an alternative choice is specified to be the sum of a deterministic and random component. The deterministic part of the indirect utility for each alternative depends on observed attributes of the alternatives chosen and individual characteristics.

Random Utility Model (RUM) has widely been used in recreational choice modeling. The RUM considers an individual's choice of one recreational activity is derived form a set of alternatives. Since, travel expenditure is included as one of the characteristics in the model, it captures the trade offs between money and site characteristics which makes estimation of the numerical non-use value possible.

Discrete choice RUM is usually employed to explain how an individual will chose among a discrete number of alternatives as a function of the recreational expenditure and characteristics of the alternative choices. The RUM estimates the total use value for multiple recreational choices. The model includes indirect utility functions, which are specified for each of the alternatives. These conditional indirect utility functions have components that are random from the analyst's point of view. The random components of the utilities of the different alternative choices are assumed to be independent and identically distributed (IID) with type I extreme value (Gumbel) distribution. This distribution will give rise to the multinomial logit model when data are individual

specific (Green, 2002). If each of the random components is independently drawn from a logistic distribution, then it is a multinomial logit model. These random errors allows for particular taste variation across the individuals.

Morey et al. (1993) observed that the probability of choosing to fish in one site in time *t* affects the decision to participate in subsequent time and site. Similarly, Shaw and Jakus (1996) conclude the magnitude of welfare measure is function of available alternatives and particular sample characteristics. The study employs random utility model using multinomial logit to estimate the demand for rock climbing for changing access to the site. The study calculates the estimates of consumer surplus as welfare measures associated with seasonal closure of the climbing site. However, more information is required to make the estimation more valid.

Similarly, Kurt et al. (2001) uses nested random utility model to examine hunter choice behavior over site and season selection. Study incorporates choices over both hunting sites and hunting seasons to estimate the value of changes in seasonal length. The study finds different site characteristics affect the individual hunting decision and longer hunting season attract more hunters than shorter season.

In this study, we use random utility models to find the factors determining the choice of costal recreational behavior. We explain individual choice, by specifying the functions for utility derived from available alternative recreation choices. The functions are estimated using multinomial logit specification on individual trips and site characteristics variables. Study estimates the probability of choosing an activity from a choice of off-shore fishing, bird watching, beach combing, swimming, and Marsh fishing in Elmer's Island, Louisiana.

Study Area

Elmer's Island, one of the most popular coastal recreation sites of Louisiana, has been closed since 2001 because of the dispute over the selling price. The negotiations with the Elmer's families began in May of 2003 but have since stalled because of dispute over appraised value. Initial estimates to property values ranged from $6million, by the Elmer's family, to a preliminary estimate of $1 million by the state contracted land appraiser. The State of Louisiana has offered the price to purchase the Island from Elmer

family after the death of Mr. Elmer. The open market price has been condemned for failing to capture prices reflective of environmental and non-use option for coastal recreation resulting in to controversy over selling price offered by the state.

Elmer's Island had been very popular destination for people who choose coastal recreation with a small entrance fee. For the past thirty years, Elmer's Island has been operated as a commercial campground and primitive area. The property has become a popular destination not only to Louisiana residents but also to out of state tourists (Curole and St. Pe 2002). For nominal fee, users have had access to the location for fishing, bird watching, camping and beach combing. The area also provides significant habitat of numerous bird species and other forms of coastal marine life. In addition, the island is one of the only three accessible beaches in Louisiana. This creates a public pressure to reopen the island for public recreational use. Thus our study originates from such a price controversy over the Island's monetary value. In this study we attempt to estimate a demand function associated with recreational choices. The Study area is shown here in figure 1.

Data

Collecting data on individuals visiting the Elmer's Island is very difficult because of varying nature of recreational activities in the Island, which is closed. Intercept survey on proxy sites raises the concern of whether the sample represents general population visiting Elmer's Island (Shaw, 1988). Furthermore, the samples obtained by mailing the population impose extremely high cost and low response rate. This is mainly because most of household consist zero visits. We therefore, use internet survey, where the respondents are self selective. Using both intercept and internet survey our study expects to reduce some interview bias and self selection bias, under a constrained budget.

Most of the observations (92%) are obtained from online survey posted on the web server. Louisiana State University, Department of Agricultural Economics and Agribusiness provided the space for application on their webpage. Survey remained on the web for 77 days starting from May 15th to July 31st, 2003. Online survey responses were formatted in such a way that responses were recorded in a Microsoft excels spreadsheet automatically, once submitted. Duplicate responses were identified and

deleted for any submissions with same internet protocol address. Solicitation for the responses and announcement were posted on twenty eight media including direct mails, radio programs, newspapers, magazines, websites and newsletters.

Intercept survey was conducted at Grand Island State Park and Holley beach considering these sites as proxy for Elmer's Island. Commemorative caps were distributed to cooperating individuals on filling out a questionnaire set containing 34 individual questions. The intercept survey was conducted within 42 days using a series of multi-day trips to the sites during June and July, 2003.

Out of 2691 online responses, 252 observations were dropped from the survey because of insufficient and unwanted information filled out in the questionnaire set. The dependent variable is a category of people's preference to visit the Island. In addition, the survey gathered a variety of information form visitors. The information included demographic variables such as age, gender, income, preference over different site quality, the purpose of their visit to evaluate whether joint or incidental visit have any affect on recreation demand.

Travel cost variable included price paid by individual for recreational and non recreational activities during the trip. The variables include cost of lodging, food, fuel, entry fee. Loomis, Yorizane & Douglas (2000) argue against trading time and money for a wage rate. Bockstael et al. (1987) suggest that time constraint can not be incorporated with budget constraint and therefore; the time and cost are treated separately in this paper. The travel time in our study, includes the time to travel to the Island and time spent on site.

Measuring the Site Characteristics

Site characteristics are important in modeling demand function for recreational choice. However, the existing literature on recreational demand estimation does not guide us which variables are more important. Therefore, we must use our own idea to select the variables that may have impact on consumer demand for recreational choice. Importance of site's physical and environmental characteristics is considered as explanatory site characteristic variables in the model. Level of importance of the site's characteristics is measured using 5 scale preference level (5 being very important). Environmental

characteristics include wild life and existence of pollution while, physical characteristic includes human congestion, camping facility, interpretive signs, level of development, rule and regulations, nearby food and lodging, accessibility, and total catch of fish per trip. Level of importance for all variables within physical and environmental characteristics is aggregated in order to change the preference level into a preference index.

Model

Random utility model for recreational hunting, fishing, rock climbing, lake recreation are used to explain individual choices over substitute sites and targets (). The utility from a recreational trip is specified as the function of expected quality of trips as measured by characteristic of the choices and individual. These functions are estimated by using Multinomial Logit which imposes the Independence of Irrelevant Alternative assumption (IIA). Assuming that an individual i faces m exhaustive and mutually exclusive alternatives. We can represent the derived utility from choosing alternative j as;

$$U_{ij} = V_{ij} + e_{ij}$$

Where, V_{ij} is the non stochastic component of total utility function and is a random e_{ij} is the unobservable component. V_{ij} depends on the characteristics of alternatives and of decision maker and is typically specified as linear in parameters with $V_{ij} = X_{ij}b$. X_{ij} is a vector of observable characteristics as perceived by an individual i that affect the utility derived from visiting the site j. The choice is made $\{ y_i = j \}$ is expressed using random utility function as;

$$U_{ij} \geq \max_{k \in C_{i,k \neq j}} U_{ik}$$

The individual chooses an alternative providing greater level of utility from a set of choices. Considering such a discrete choice problem, where a most preferred choice is observed, probability of that choice is expressed as;

$$P_{y_i = j)} = \frac{\exp(x`_{ij} b)}{\sum_{k \in C_i} \exp(x`_{ik} b)}$$

here, y_i is the set of choice variables that contains possible alternatives for each decision maker.

The log likelihood function is expressed as;

$$\ell = \sum_{i=1}^{N} \sum_{j=}^{m} d_{ij} \ln p[y_i = j]$$

Where, d_{ij} = 1 if individual I chooses an alternative j and 0 otherwise.

In multinomial logit, regressors do not vary across choices; coefficients are estimated for any choice. MNL requires one of the choice (j) variables to be treated as a base category. The correspondent b_j is constrained to zero.

Since, the dependent variable is the log of ratio of proportion of choices, interpreting the coefficients directly is difficult. Consequently, marginal effects and elasticities are estimated at the mean levels of variables. Marginal effects are estimated as;

$$\frac{\partial y_{ij}}{\partial x_{ij}} = \left(b_{jx} - \sum_{k \in C_i} y_{ij} b_{jx} \right) y_{ij}$$

Where, b_{jx} is the coefficient of characteristic x for recreation alternative j. The marginal effects for the multinomial logit model are not monotonic, however, they may depend on the point of evaluation and they can differ in sign from coefficients.

The elasticity of alternatives with respect to x is given by;

$$e_{ijx} = \frac{\partial y_{ij}}{\partial x_{ij}} . \frac{x_i}{y_i} = \left(b_{jx} - \sum_{k \in C_i} y_{ij} b_{jx} \right) x_{ij}$$

The elasticity may also vary in sign from the estimated coefficient because the above equation contains terms for the estimated coefficient b_{jx}, values of x and alternatives y_j. The standard errors for marginal effects and elasticities are obtained by using the delta method, which involves pre and post multiplying the covariance matrix for the estimated modified multinomial logit parameters by the gradient vector of marginal effects and elasticities with respect to parameters.

Result and Discussion

The computer software STATA is used to estimate the coefficients, marginal values and elasticities of variables. Since direct interpretation of coefficient is difficult for the estimates from multinomial logit model, the marginal effect and elasticities are used to describe the impact of variables on costal recreation choice. The tables 1 to 5 provide the coefficient and p values for the estimation for 5 different bases. Marginal effects measure the probability of change in recreation choice with respect demographic and characteristic variables. The sign of marginal effect and elasticities need not to be same as coefficients.

Considering offshore fishing as a base category, table 1 provides estimation for coefficients, marginal values and elasticities. The study result shows that travelers who have less leisure time will enjoy bird watching (as the total time spent on site has negative elasticity with respect to bird watching variable). And conversely, one percent increase in time increases the probability of camping by 0.23%. Contrary to expectations, the model shows statistically insignificant impacts of total time spent on site for

recreation choice. The finding is not consistent with previous results of Hanemann (1987) and Loomis et al. (2000). In addition, the estimation reveals that recreation choice is unresponsive to the money spent for the recreational trip. Insignificant income effect is also a common problem in recreation demand model.

Individuals who visits the island for camping, places the environmental quality of the site as important factor affecting their recreational choice. However, the environmental importance variable is insignificant for other types of activities. Result also shows that camping decision is also affected by the physical characteristic of the island. Similarly, being female decreases the probability of visiting island for surf fishing but increases the probability of swimming. Married individual is more likely to go camping and surf fishing than a single. And more flexible hour an individual has the more likely that he chooses to go surf fishing.

Study result shows that the purpose of visit has significant negative marginal effect on camping as compared to offshore fishing. That is, if individual's primary purpose of trip is costal recreation, then they are less likely to choose camping. However, they are more likely to choose camping in Louisiana coasts if their main purpose of taking trip is not only coastal recreation as shown in Table 1. The marginal effect of purpose is negative for the bird watching indicating that the individuals who visit Louisiana coast on the way of other goal are more likely to choose bird watching. Individuals, who give higher values to importance of environmental quality of the sites, are less likely to choose camping. While the individuals giving more value to physical characteristics of site are more like to choose camping at the coasts.

When compared to surf fishing (Table 2), income is negatively related to camping and has no significant impact on other choices. Female prefers to go to the coasts for swimming than man does, as the dummy (female=1) for gender has positive marginal effect on swimming. Environmental site qualities are negatively related to consumer's choice for swimming and camping. People who place higher importance to environmental quality of sites are less likely to choose camping and swimming in the Elmer's Island. Married individual are less likely to select off shore fishing in Louisiana coast than singles. More flexible hours reduces the offshore fishing and increases the surf fishing in the Louisiana coast.

The result states that increase in amount of time that an individual spend on coastal recreation increases the probability of choosing camping or surf fishing. Married individuals are more likely to choose the coastal visitation for camping and surf fishing than single when we chose bird watching as a base category. Flexibility of working hour is negative on offshore fishing and positive on surf fishing. Such result indicate that more flexibility on working hour increases the surf fishing and decreases the off shore fishing. Again, negative marginal effect of income for camping says the wealthier individual likes not to spend their night in tents. Finally, when we compare the choices with camping, marginal effect of gender dummy (1=female) is negatively related to surf fishing and positively related to swimming and bird watching.

Elasticity estimate shows that importance of environmental characteristics of the site has the highest negative effect. If an individual gives higher importance to the environmental quality of recreation site they are less likely to choose swimming in the coastal Louisiana. However the physical characteristics of site are not seen to be so important. Total time spent in site and total expenditure for the trips have negligible marginal impact but they have negative elasticity on choices. The time spent shows the positive elasticity with camping.

Conclusions

We employed a random utility model to understand consumer's preference over recreational choice in Elmer's Island. We used multinomial logit model to analyze determinants of choice for recreation. We grouped all the alternative choices of recreational activity in to six categories, namely off-shore fishing, surf fishing, bird watching, camping, swimming and beach combing. The result shows significant marginal effect of individual's demographic characteristics and sites physical and environmental characteristics. However, major recreational choice variables such as individual's income, time spent in the site, and travel expenditures are found to be insignificant. Insignificant effect of income is seen frequently in the study relating recreational choice behavior. Insignificant impact of major recreational choice variables might have been because of non randomness of data.

References

Bockstael N.I. and Hanemann M., 1987. Time and the Recreation Demand Model.

American Journal of Agricultural Economics 69:296-302.

Green, W. H. 2002. *Econometric Analysis. Fifth Edition.* Pearson Education Inc., Upper Saddle River New Jersy.

Kurt, A.S., P.W. Achuhmann, R. Boyd, and D. Doroodian, 2001. The Value of Changes in Deer Season Length: An Application of The Nested Model. *Environmental and Resource Economics* 19:131-147.

Loomis, J., Yorizane, S. & Larson, D., 2000. Testing Significance of Multi-destination and Multi-purpose Trip Effects on a Travel Cost Method Demand Model for Whale Watching Trips. *Agricultural and Resource Economics Review* 29:183-191.

Morey, E., W.D. Shaw and M.Watson, 1993. A Repeated Nested Logit Model of Atlantic Salmon Fishing. *American Journal of Agricultural Economics* 75:578-592.

Shaw, D., 1988. On-Site Samples Regression: Problems of Non Negative Integers, Truncation and Endogenous Stratification. *Journal of Econometrics* 37: 211-23.

Shaw, W.D. & Jakus, P. 1996. Travel cost models of the demand for rock climbing. *Agricultural and Resource Economics Review* 25:133-42.

Table 1: Multinomial Logit Estimation for Recreational Choice in Louisiana Coast base =offshore fishing

Variables	2 Surf fishing			3 Bird watching			4 Camping			5 Swimming		
	Coef	Mar Effect	Elast	Coef	Mar Effect	Elast	Coef	Mar Effect	Elast	Coef	Mar Effect	Elast
		dy/dx	ey/ex		dy/dx	ey/ex		dy/dx	ey/ex		dy/dx	ey/ex
Constant	-0.62	P>|z|	P>|z|	-5.82	P>|z|	P>|z|	-3.99	P>|z|	P>|z|	-3.89	P>|z|	P>|z|
	-0.41			0.00			0.01			0.00		
Purpose of visit 1=pimary 0=joint+incedental	-0.08	0.004	0.002	-0.56	-0.002	-0.299	*-0.48*	-0.010	-0.246	0.00	0.002	0.052
	0.64	0.812	0.845	0.10	0.229	0.115	*0.11*	0.125	0.108	1.00	0.718	0.722
type of visit 1= day visit, 0=night visit	0.07	0.007	0.004	0.51	0.002	0.190	-0.44	-0.012	-0.213	0.39	0.008	0.141
	0.69	0.662	0.638	0.19	0.347	0.207	0.20	0.068	0.083	0.20	0.237	0.196
Total time spent in site (hours)	0.00	0.000	0.016	-0.01	0.000	-0.697	0.01	0.000	0.230	0.00	0.000	-0.076
	0.08	0.135	0.135	0.12	0.125	0.026	0.00	0.008	0.006	0.56	0.585	0.582
Total expenditure(dollars)	0.00	0.000	0.016	0.00	0.000	-1.924	0.00	0.000	-0.006	0.00	0.000	-0.292
	0.96	0.009	0.009	0.01	0.000	0.006	0.71	0.913	0.913	0.23	0.170	0.241
Site's Characteristics 1=important 0=not	0.29	-0.005	-0.028	0.57	0.001	0.240	1.92	0.022	1.523	0.72	0.009	0.383
	0.37	0.888	0.471	0.48	0.684	0.737	0.07	0.001	0.110	0.24	0.353	0.454
Sites physical Characteristics	0.05	0.001	0.029	0.10	0.000	1.164	0.11	0.002	1.473	0.07	0.001	0.502
	0.02	0.511	0.511	0.02	0.231	0.136	0.00	0.019	0.021	0.04	0.390	0.381
Sites Environmental Characteristics	0.06	0.016	0.225	-0.10	-0.001	-1.668	-0.23	-0.007	-3.170	-0.20	-0.006	-2.828
	0.08	0.000	0.000	0.11	0.124	0.012	0.00	0.000	0.000	0.00	0.000	0.000
Gender 1= Female 0 = Male	0.06	-0.075	-0.096	2.21	0.009	2.288	0.99	0.021	0.940	2.45	0.057	2.553
	0.87	0.010	0.011	0.00	0.063	0.000	0.02	0.010	0.007	0.00	0.000	0.000
Marital Status 1=married 0=single	0.71	0.046	0.030	0.81	0.001	0.112	1.35	0.015	0.526	0.79	0.003	0.097
	0.00	0.026	0.050	0.05	0.666	0.699	0.00	0.014	0.041	0.01	0.583	0.634
Flexibilty of Job 1= Flexible 0=not	0.43	0.026	0.036	0.79	0.002	0.464	0.58	0.005	0.216	0.39	0.000	-0.012
	0.04	0.104	0.104	0.01	0.167	0.038	0.03	0.301	0.298	0.16	0.956	0.956
Income (Dollars)	-0.10	0.007	0.022	-0.02	0.000	0.239	-0.57	-0.012	-1.186	-0.33	-0.005	-0.562
	0.42	0.523	0.524	0.94	0.709	0.709	0.02	0.021	0.022	0.13	0.246	0.233

Table 2: Multinomial Logit Estimation for Recreational Choice in Louisiana Coast base=surf fishing

Variables	1 Offshore Fishing			3 Bird watching			4 Camping			5 Swimming		
	Coef	Mar Effect	Elast	Coef	Mar Effect	Elast	Coef	Mar Effect	Elast	Coef	Mar Effect	Elast
		dy/dx	ey/ex		dy/dx	ey/ex	4	dy/dx	ey/ex	5	dy/dx	ey/ex
Constant	0.6239	P>|z|	P>|z|	-5.1923	P>|z|	P>|z|	-3.3631	P>|z|	P>|z|	-3.2619	P>|z|	P>|z|
	0.406			0			0.012			0.001		
Purpose of visit 1=pimary 0=joint+incedental	0.0806	0.01	0.05	-0.4832	0.00	-0.30	-0.3979	-0.01	-0.25	0.08	0.00	0.05
	0.642	0.59	0.60	0.114	0.23	0.11	0.115	0.12	0.11	0.741	0.72	0.72
type of visit 1= day visit, 0=night visit	-0.0726	-0.01	-0.03	0.4355	0.00	0.19	-0.5095	-0.01	-0.21	0.3214	0.01	0.14
	0.693	0.70	0.71	0.22	0.35	0.21	0.086	0.07	0.08	0.223	0.23	0.20
Total time spent in site (hours)	-0.0046	0.00	-0.18	-0.017	0.00	-0.70	0.0051	0.00	0.23	-0.0022	0.00	-0.08
	0.078	0.07	0.08	0.023	0.13	0.03	0.013	0.01	0.01	0.519	0.59	0.58
Total expenditure(dollars)	0.00	0.00	0.02	-0.0025	0.00	-1.92	-3E-05	0.00	-0.01	-0.0004	0.00	-0.29
	0.961	0.09	0.09	0.006	0.00	0.01	0.705	0.91	0.91	0.226	0.17	0.24
Site's Characteristics 1=important 0=not	-0.2873	-0.03	-0.30	0.2831	0.00	0.24	1.6375	0.02	1.52	0.4342	0.01	0.38
	0.365	0.36	0.28	0.71	0.68	0.74	0.112	0.00	0.11	0.436	0.34	0.45
Sites physical Characteristics	-0.0453	0.00	-0.97	0.0514	0.00	1.16	0.0654	0.00	1.47	0.0214	0.00	0.50
	0.021	0.01	0.01	0.149	0.23	0.14	0.028	0.02	0.02	0.424	0.39	0.38
Sites Environmental Characteristics	-0.0577	0.00	-0.46	-0.1594	0.00	-1.67	-0.2859	-0.01	-3.17	-0.2571	-0.01	-2.83
	0.077	0.19	0.19	0.005	0.12	0.01	0	0.00	0.00	0	0.00	0.00
Gender 1= Female 0 = Male	-0.055	-0.01	-0.16	2.1589	0.01	2.29	0.9378	0.02	0.94	2.3985	0.06	2.55
	0.867	0.63	0.64	0	0.06	0.00	0.004	0.01	0.01	0	0.00	0.00
Marital Status 1=married 0=single	-0.7077	-0.06	-0.52	0.1051	0.00	0.11	0.6392	0.01	0.53	0.0865	0.00	0.10
	0	0.00	0.00	0.78	0.67	0.70	0.061	0.01	0.04	0.751	0.58	0.63
Flexibilty of Job 1= Flexible 0=not	-0.4267	-0.03	-0.47	0.3614	0.00	0.46	0.1518	0.00	0.22	-0.0405	0.00	-0.01
	0.044	0.04	0.04	0.058	0.17	0.04	0.4	0.30	0.30	0.827	0.96	0.96
Income (Dollars)	0.1038	0.01	0.29	0.0844	0.00	0.24	-0.471	-0.01	-1.19	-0.2275	-0.01	-0.56
	0.419	0.34	0.34	0.737	0.71	0.71	0.023	0.02	0.02	0.228	0.24	0.23

Table 3: Multinomial Logit Estimation for Recreational Choice in Louisiana Coast base=bird watching

	1 Offshore Fishing			2 Surf fishing			4 Camping			5 Swimming		
Variables	Coef	Mar Effect	Elast	Coef	Mar Effect	Elast	Coef	Mar Effect	Elast	Coef	Mar Effect	Elast
		dy/dx	ey/ex	2	dy/dx	ey/ex	4	dy/dx	ey/ex	5	dy/dx	ey/ex
Constant	5.8162	P>|z|	P>|z|	5.1923	P>|z|	P>|z|	1.8292	P>|z|	P>|z|	1.9304	P>|z|	P>|z|
	0			0			0.324			0.221		
Purpose of visit 1=pi mary 0=joint+incedental	0.5639	0.01	0.05	0.4832	0.00	0.00	0.0853	-0.01	-0.25	0.5632	0.00	0.05
	0.101	0.59	0.60	0.114	0.81	0.85	0.825	0.12	0.11	0.124	0.72	0.72
type of visit 1= day visit, 0=night visit	-0.5081	-0.01	-0.03	-0.4355	0.01	0.00	-0.945	-0.01	-0.21	-0.1141	0.01	0.14
	0.194	0.70	0.71	0.22	0.66	0.64	0.036	0.07	0.08	0.785	0.23	0.20
Total time spent in site (hours)	0.0124	0.00	-0.18	0.017	0.00	0.02	0.0222	0.00	0.23	0.0149	0.00	-0.08
	0.115	0.07	0.08	0.023	0.14	0.14	0.004	0.01	0.01	0.064	0.59	0.58
Total expenditure(dollars)	0.0025	0.00	0.02	0.0025	0.00	0.02	0.0025	0.00	-0.01	0.0021	0.00	-0.29
	0.006	0.10	0.09	0.006	0.01	0.01	0.007	0.91	0.91	0.027	0.17	0.24
Site's Characteristics 1=important 0=not	-0.5704	-0.03	-0.30	-0.2831	0.00	-0.03	1.3544	0.02	1.52	0.1512	0.01	0.38
	0.48	0.36	0.28	0.71	0.89	0.47	0.281	0.00	0.11	0.867	0.34	0.45
Sites physical Characteristics	-0.0967	0.00	-0.97	-0.0514	0.00	0.03	0.014	0.00	1.47	-0.03	0.00	0.50
	0.015	0.01	0.02	0.149	0.51	0.51	0.756	0.02	0.02	0.474	0.39	0.38
Sites Environmental Characteristics	0.1016	0.00	-0.46	0.1594	0.02	0.22	-0.1265	-0.01	-3.17	-0.0977	-0.01	-2.83
	0.108	0.19	0.19	0.005	0.00	0.00	0.074	0.00	0.00	0.136	0.00	0.00
Gender 1= Female 0 = Male	-2.2139	-0.01	-0.16	-2.1589	-0.08	-0.10	-1.221	0.02	0.94	0.2396	0.06	2.55
	0	0.63	0.64	0	0.01	0.01	0.006	0.01	0.01	0.538	0.00	0.00
Marital Status 1=married 0=single	-0.8129	-0.06	-0.52	-0.1051	0.05	0.03	0.534	0.01	0.53	-0.0187	0.00	0.10
	0.048	0.00	0.00	0.78	0.03	0.05	0.279	0.01	0.04	0.966	0.58	0.63
Flexibilty of Job 1= Flexible 0=not	-0.7881	-0.03	-0.47	-0.3614	0.03	0.04	-0.2096	0.00	0.22	-0.4019	0.00	-0.01
	0.005	0.04	0.04	0.058	0.10	0.10	0.404	0.30	0.30	0.101	0.96	0.96
Income (Dollars)	0.0195	0.01	0.29	-0.0844	0.01	0.02	-0.5552	-0.01	-1.19	-0.3119	-0.01	-0.56
	0.944	0.34	0.34	0.737	0.52	0.52	0.081	0.02	0.02	0.296	0.24	0.23

Table 4: Multinomial Logit Estimation for Recreational Choice in Louisiana Coast base =camping

Variables	1 Offshore Fishing			2 Surf Fishing			3 Bird Watching			5 Swimming		
	Coef	Mar Effect	Elast	Coef	Mar Effect	Elast	Coef	Mar Effect	Elast	Coef	Mar Effect	Elast
		dy/dx	ey/ex		dy/dx	ey/ex	3	dy/dx	ey/ex	5	dy/dx	ey/ex
Constant	3.99	P>|z|	P>|z|	3.36	P>|z|	P>|z|	-1.83	P>|z|	P>|z|	0.10	P>|z|	P>|z|
	0.01			0.01			0.32			0.95		
Purpose of visit 1=pimary 0=joint+incedental	0.48	0.01	0.05	0.40	0.00	0.00	-0.09	0.00	-0.30	0.48	0.00	0.05
	0.11	0.59	0.60	0.12	0.81	0.85	0.83	0.23	0.11	0.15	0.72	0.72
type of visit 1= day visit, 0=night visit	0.44	-0.01	-0.03	0.51	0.01	0.00	0.95	0.00	0.19	0.83	0.01	0.14
	0.20	0.70	0.71	0.09	0.66	0.64	0.04	0.35	0.21	0.03	0.23	0.20
Total time spent in site (hours)	-0.01	0.00	-0.18	-0.01	0.00	0.02	-0.02	0.00	-0.70	-0.01	0.00	-0.08
	0.00	0.07	0.08	0.01	0.14	0.14	0.00	0.13	0.03	0.05	0.59	0.58
Total expenditure(dollars)	0.00	0.00	0.02	0.00	0.00	0.02	0.00	0.00	-1.92	0.00	0.00	-0.29
	0.71	0.09	0.09	0.71	0.01	0.01	0.01	0.00	0.01	0.27	0.17	0.24
Site's Characteristics 1=important 0=not	-1.92	-0.03	-0.30	-1.64	0.00	-0.03	-1.35	0.00	0.24	-1.20	0.01	0.38
	0.07	0.36	0.28	0.11	0.89	0.47	0.28	0.68	0.74	0.29	0.34	0.45
Sites physical Characteristics	-0.11	0.00	-0.97	-0.07	0.00	0.03	-0.01	0.00	1.16	-0.04	0.00	0.50
	0.00	0.01	0.02	0.03	0.51	0.51	0.76	0.23	0.14	0.24	0.39	0.38
Sites Environmental Characteristics	0.23	0.00	-0.46	0.29	0.02	0.22	0.13	0.00	-1.67	0.03	-0.01	-2.83
	0.00	0.19	0.19	0.00	0.00	0.00	0.07	0.12	0.01	0.62	0.00	0.00
Gender 1= Female 0 = Male	-0.99	-0.01	-0.16	-0.94	-0.08	-0.10	1.22	0.01	2.29	1.46	0.06	2.55
	0.02	0.63	0.64	0.00	0.01	0.01	0.01	0.06	0.00	0.00	0.00	0.00
Marital Status 1=married 0=single	-1.35	-0.06	-0.52	-0.64	0.05	0.03	-0.53	0.00	0.11	-0.55	0.00	0.10
	0.00	0.00	0.00	0.06	0.03	0.05	0.28	0.67	0.70	0.18	0.58	0.63
Flexibilty of Job 1= Flexible 0=not	-0.58	-0.03	-0.47	-0.15	0.03	0.04	0.21	0.00	0.46	-0.19	0.00	-0.01
	0.03	0.04	0.04	0.40	0.11	0.10	0.40	0.17	0.04	0.43	0.96	0.96
Income (Dollars)	0.57	0.01	0.29	0.47	0.01	0.02	0.56	0.00	0.24	0.24	-0.01	-0.56
	0.02	0.34	0.34	0.02	0.52	0.52	0.08	0.71	0.71	0.36	0.24	0.23

Table 5: Multinomial Logit Estimation for Recreational Choice in Louisiana Coast base=swimming

	1 Offshore Fishing			2 Surf Fishing			3 Bird Watching			4 Camping		
Variables	Coef	Mar Effect	Elast	Coef	Mar Effect	Elast	Coef	Mar Effect	Elast	Coef	Mar Effect	Elast
		dy/dx	ey/ex	2	dy/dx	ey/ex	3	dy/dx	ey/ex	4	dy/dx	ey/ex
Constant	3.89	P>|z|	P>|z|	3.26	P>|z|	P>|z|	-1.93	P>|z|	P>|z|	-0.10	P>|z|	P>|z|
	0.00			0.00			0.22			0.95		
Purpose of visit 1=pimary 0=joint+incedental	0.00	0.01	0.05	-0.08	0.00	0.00	-0.56	0.00	-0.30	-0.48	-0.01	-0.25
	1.00	0.59	0.60	0.74	0.81	0.85	0.12	0.23	0.11	0.15	0.12	0.11
type of visit 1= day visit, 0=night visit	-0.39	-0.01	-0.03	-0.32	0.01	0.00	0.11	0.00	0.19	-0.83	-0.01	-0.21
	0.20	0.70	0.71	0.22	0.66	0.64	0.79	0.35	0.21	0.03	0.07	0.08
Total time spent in site (hours)	0.00	0.00	-0.18	0.00	0.00	0.02	-0.01	0.00	-0.70	0.01	0.00	0.23
	0.56	0.08	0.08	0.52	0.15	0.15	0.06	0.13	0.03	0.05	0.01	0.01
Total expenditure(dollars)	0.00	0.00	0.02	0.00	0.00	0.02	0.00	0.00	-1.92	0.00	0.00	-0.01
	0.23	0.11	0.09	0.23	0.01	0.01	0.03	0.00	0.01	0.27	0.91	0.91
Site's Characteristics 1=important 0=not	-0.72	-0.03	-0.30	-0.43	0.00	-0.03	-0.15	0.00	0.24	1.20	0.02	1.52
	0.24	0.37	0.28	0.44	0.89	0.47	0.87	0.68	0.74	0.29	0.00	0.11
Sites physical Characteristics	-0.07	0.00	-0.97	-0.02	0.00	0.03	0.03	0.00	1.16	0.04	0.00	1.47
	0.04	0.02	0.02	0.42	0.51	0.51	0.47	0.23	0.14	0.24	0.02	0.02
Sites Environmental Characteristics	0.20	0.00	-0.46	0.26	0.02	0.22	0.10	0.00	-1.67	-0.03	-0.01	-3.17
	0.00	0.20	0.19	0.00	0.00	0.00	0.14	0.12	0.01	0.62	0.00	0.00
Gender 1= Female 0 = Male	-2.45	-0.01	-0.16	-2.40	-0.08	-0.10	-0.24	0.01	2.29	-1.46	0.02	0.94
	0.00	0.63	0.64	0.00	0.01	0.01	0.54	0.06	0.00	0.00	0.01	0.01
Marital Status 1=married 0=single	-0.79	-0.06	-0.52	-0.09	0.05	0.03	0.02	0.00	0.11	0.55	0.01	0.53
	0.01	0.00	0.00	0.75	0.04	0.08	0.97	0.67	0.70	0.18	0.01	0.04
Flexibilty of Job 1= Flexible 0=not	-0.39	-0.03	-0.47	0.04	0.03	0.04	0.40	0.00	0.46	0.19	0.00	0.22
	0.16	0.05	0.04	0.83	0.12	0.12	0.10	0.17	0.04	0.43	0.30	0.30
Income (Dollars)	0.33	0.01	0.29	0.23	0.01	0.02	0.31	0.00	0.24	-0.24	-0.01	-1.19
	0.13	0.35	0.34	0.23	0.53	0.53	0.30	0.71	0.71	0.36	0.02	0.02

Figure 1. Map of the Study Area