



# Valuing nature-based recreation in public natural areas of the Apalachicola River region, Florida

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## Abstract

As more people visit natural areas for tourism and recreation purposes, it is becoming increasingly important to understand the value they place on these natural resources. Specifically, tourists to Florida have been increasingly interested in visiting natural areas, forests, parks, and preserves—highlighting the importance of this new and growing phenomenon. We analyze visitors' demand for nature-based recreation in the Apalachicola River region of Florida using the travel cost method. The results from a count data regression model reveal that on average visitors would pay \$74.18 per visit-day for nature-based recreation resulting in a total economic value of \$484.56 million attributable to nature-based recreation in the Apalachicola River region. Results of this study provide useful information for natural resources management in the region and a rationale to preserve Florida's unique ecosystems.

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## 1. Introduction

Nature-based recreation is an integral part of American society. The most recent National Survey on Recreation and the Environment (2000–2001, NSRE) reported that approximately 97% of the US population participates in some form of outdoor recreation each year (Cordell et al., 2002). Survey results indicate that over 206 million people 15 years or older participate in outdoor recreation activities each year; many of these participants are looking to forests, parks, and preserves to participate in these activities. Visitors use natural areas to participate in nature-based recreation activities such as walking, recreating with family and friends, sightseeing, picnicking, and viewing nature scenery, which are among the most popular outdoor recreation activities in the US (Cordell et al., 2002).

Nature-based recreation and tourism is touted as a sustainable means to preserve natural resources while providing a diversity of economic benefits to local

communities and national economies (Gossling, 1999; Wunder, 2000; Wood, 2002). Nature-based recreation provides visitors with an opportunity to satisfy their recreation needs while maintaining the diversity and richness of an area's natural, cultural, and historical resources. Recreation visitors look for natural areas to meet their recreation needs, and often travel to distant areas for recreation. This hints at a high demand for such areas and resources, but many areas are struggling to measure these values.

To better understand and articulate the value of nature-based recreation, researchers seek to identify measurable variables that reflect economic values associated with nature-based recreation. To explore these values in Florida, where nature-based tourism is currently an under-studied topic, we analyzed nature-based tourism demand and tourists' preferences for natural settings to understand the factors influencing nature-based tourism. Through this analysis, we estimated the economic value of nature-based recreation opportunities in relatively rural and undeveloped sites, where recreation activities are primarily driven by the naturalness of the forest and water resources.

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We conducted a survey of recreation visitors in selected public natural areas of the Apalachicola River region in Florida. The Apalachicola River region is a relatively rural area with little infrastructure and managed recreation facilities. State and federal public natural areas are common throughout the region and provide a number of nature-based recreation opportunities, including hiking, camping, birding, boating, hunting, and fishing.

Recreation demand and underlying economic values of natural resources are routinely estimated using various methods and models (Mitchell and Carson, 1989; Freeman III, 1993; Bateman and Willis, 1999; Haab and McConnell, 2002). We use the travel cost method (TCM) to analyze nature-based recreation demand and estimate economic value of the natural resources.

Travel cost demand analysis is based on the visitors' recreation behavior and preferences in terms of their visits, travel cost, time, and natural resource settings (Ward and Beal, 2000). Since visitors must travel to a particular site with preferred natural resources and attributes to attain the desired nature-based recreation experience, their travel behavior provides important information to analyze nature-based recreation demand. The travel cost demand models can be used to estimate the economic value of nature-based recreation, which represents the indirect measure of net benefit or consumer surplus (Willig, 1976; Creel and Loomis, 1990; Hellerstein, 1991).

## 2. Apalachicola River region

Florida's natural areas, including federal, state, and county parks, state and national forests, and conservation lands, are important resources for nature-based tourists to attain quality recreation experiences. However, Florida's increasing tourism inflow and rapid rate of urbanization are exerting more pressure on the natural resource base and potential nature-based recreation sites. The number of tourists coming to Florida is expected to increase to 57 million visitors per year by 2005, a 25% increase from 1996 (Struhs and Mainella, 2000). With a population density of 296.4 persons per square mile, nearly four times the national average, coupled with persistent population growth (US Census Bureau, 2003), more demand for nature-based recreation on Florida's forests and natural areas may be anticipated. Florida ranked second in the nation after Texas for wildlife-related recreation in 1996 (Struhs and Mainella, 2000). The Florida Fish and Wildlife Commission (1998) reported that over 40% of Florida residents participate in wildlife-related recreation and 800,000 visitors came to Florida in 1996 specifically for wildlife viewing. In response to these trends, the Florida Department of Environmental Protection, Division of Recreation and Parks, and Florida Fish and Wildlife Conservation Commission are exploring recreation visitors' preferences and demand for nature-based recreation opportunities.

Located in the northern panhandle of Florida, the Apalachicola River region is predominately rural and includes a diversity of attractive, undeveloped and developed natural areas (Fig. 1). The Apalachicola River crosses into Florida from Georgia and enters the Gulf of Mexico at the town of Apalachicola in Franklin County. The region is rich in natural amenity and resources. Public natural areas include Florida's largest national forest, two national wildlife refuges, several state-managed lands, and a variety of small counties and city natural areas.

Five recreation areas were chosen for this study based on the level of development, access, and recreation opportunities provided and are, in order from least developed to most developed, St. Vincent National Wildlife Refuge, Tate's Hell State Forest, Apalachicola River Wildlife and Environment Area (WEA), Apalachicola National Forest, and St. George Island State Park.

Managed by the US Fish and Wildlife Service, St. Vincent National Wildlife Refuge is a 12,358 acre barrier island located in the Gulf of Mexico just off of the mouth of the Apalachicola River in Franklin County. Classified as our most undeveloped area, the refuge is accessible only by boat. There are no visitor facilities on the refuge and hiking is restricted to trails mostly along the outskirts of the island. The limited accessibility of the island, lack of visitor facilities, and restriction of use to daylight hours only, discourages high numbers of visitors and long on-site visits. These same conditions, however, encourage visitors who might be looking for a more adventurous experience and are interested in exploring and enjoying nature in a primitive setting.

Comprised of nearly 150,000 acres, Tate's Hell State Forest is located between the Apalachicola and Ochlockonee rivers in Franklin County. With its swampy landscape and an insect reputation befitting its name, Tate's Hell is one of the region's more undeveloped sites. Access to Tate's Hell is limited and encourages opportunities for exploration and adventure through both motorized and non-motorized activities. On-site visitor facilities are restricted to one designated hiking trail, all-terrain vehicle trails, one concrete boat launch with a wooden dock, and a few primitive camping sites in designated areas.

Similar to Tate's Hell, but slightly more developed, the Apalachicola River WEA consists of over 60,000 acres of marsh, floodplain forest, and pine flatwoods along the banks of the Apalachicola River. There are about 50 different access points, however, most roads are unpaved and many require all terrain or four-wheel drive vehicles to access the recreation area. There is very little infrastructure in the recreation area, and is therefore considered a relatively remote natural area. An observation tower and picnic area, several concrete boat ramps, and numerous opportunities for primitive camping are available in the WEA.

With 564,000 acres, Apalachicola National Forest is Florida's largest national forest. There are a number of trailheads and developed recreation areas scattered

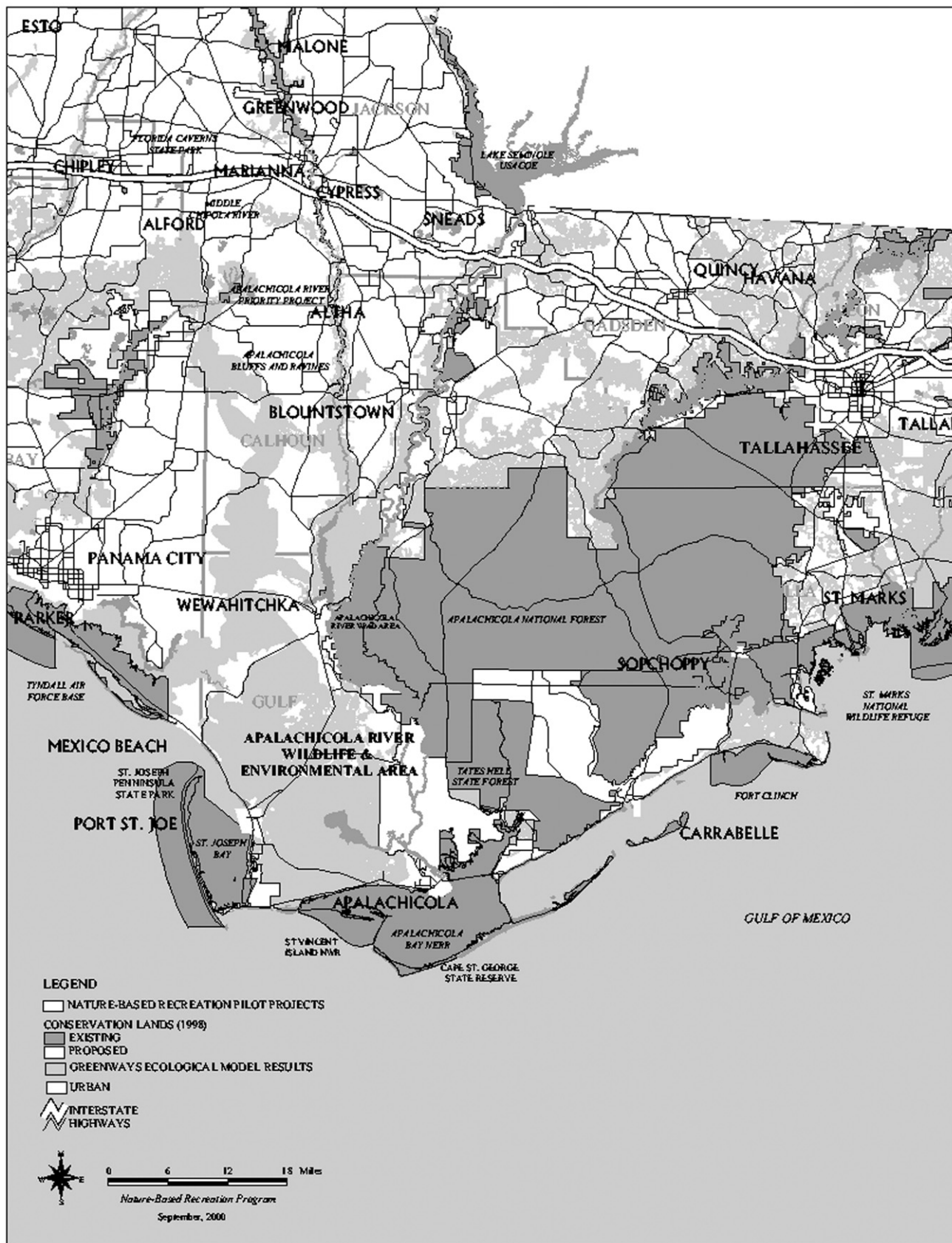


Fig. 1. Apalachicola River region study area.

throughout the forest. Furthermore, Fort Gadsden, a national historic site, is located in the forest, along the Apalachicola River. Primary recreation activities in the forest include hiking, primitive and developed camping, hunting, picnicking, fishing, and boating. The facilities and resources in the forest give visitors a chance to explore nature as well as learn about the cultural history of the area.

The most developed and visited of the five study areas, St. George Island State Park, is located on the eastern most extent of St. George Island. Nine miles long and 1962 acres in size, the park is a popular vacation destination in Franklin County. Swimming and beach activities are among the most common activities at the park. There are numerous other recreation opportunities available at the park, including developed camping (electrical hookups), primitive camping, nature trails, a youth camp, two concrete boat launches for motorboats or canoe/kayaks, boardwalks, and picnic shelters along the beaches. The park staff offers visitors regularly scheduled interpretive tours. Visitors also have the opportunity to bike, drive, or walk along the paved road that cuts through the center of the park.

### 3. Research method and survey design

#### 3.1. Nature-based recreation demand model

Travel cost demand models for nature-based recreation visits are derived from the indirect utility functions of recreation visitors. TCM is based on the basic premise that the frequency of visits to a recreation site decreases as the travel distance increases, when all else is held constant (Loomis and Walsh, 1997; Ward and Beal, 2000). Thus, the recreation trip demand is determined by travel costs, the price variable, and other relevant site characteristics and socioeconomic factors. The travel cost demand is the Marshallian (uncompensated) demand function. An integration of the area under the demand function and above the expenditure level provides an estimate of consumers' surplus (CS) representing the economic value of nature-based recreation. Various travel cost models including the individual, zonal, random utility, and hedonic travel cost models are used to estimate recreation economic values (Hellerstein and Mendelsohn, 1993; Loomis and Walsh, 1997; Ward and Beal, 2000; Haab and McConnell, 2002). Random utility models (RUM), originally developed by McFadden and applied to recreational choices by Bocksteal, Hanemann, and Kling, are typically used when estimating recreation trip demands accounting for multiple site choices (Haab and McConnell, 2002). However, our data contained individual visitors' responses to single recreation sites; therefore, we used an individual travel cost model to estimate CS for nature-based recreation in the Apalachicola River region.

The frequency of trips taken by recreation visitors in a given year was the dependent variable in the TCM and was

measured in integers. Furthermore, we could observe only a positive number of trips in recreation demand of visitors. This left non-visitors out of the distribution of recreation trips. Because of the non-negative and integer nature of the recreation trip data in our study, the ordinary least-squares (OLS) regression model is inappropriate to estimate the travel cost demand model. In this case, it is suggested that travel cost demand models should be estimated using a count data probability distribution (Cameron and Trivedi, 1986, 1998; Creel and Loomis, 1990; Grogger and Carson, 1991; Hellerstein and Mendelsohn, 1993).

In a travel cost model, nature-based recreation trip demand is a function of trip cost, natural resource characteristics including the level of naturalness, recreation activities and experiences, and socioeconomic factors including gender, age, education, and income. Then, a generic travel cost model becomes

$$Y = F(C, A, T, S, \varepsilon), \quad (1)$$

where  $Y$  represents the number of recreation trips taken to the site in past 12 months,  $C$  represents the travel costs,  $A$  is a vector of the type of natural sites and level of naturalness,  $T$  represents the visitor's major recreation activities performed at the site,  $S$  represents the vector of the socioeconomic variables, and  $\varepsilon$  is the vector of random error term representing unobserved individual factors that influence recreation decisions and is assumed to be independent and identically distributed. The basic count data model that satisfies the discrete probability distribution and non-negative integers is the Poisson distribution represented by

$$f(Y = y) = \frac{\exp(-\lambda)\lambda^y}{y!}. \quad (2)$$

This is a discrete density function, where  $y$  is an element of the set of non-negative integers. The parameter  $\lambda$  is both the mean and variance of the random variable  $Y$ , and takes strictly positive values. The variable  $Y$  is distributed independent of Poisson ( $\lambda$ ), and  $\lambda$  varies by observation as a function of the matrix of the explanatory variables  $X$  that includes  $C$ ,  $A$ ,  $T$ , and  $S$  and the parameter vector  $\beta$  as,

$$\lambda = \exp(X\beta) \quad (3)$$

with  $E(Y|X) = \text{Var}(Y|X) = \lambda = \exp(X\beta)$ .

Eq. (3) shows equality of conditional mean and variance or unity in mean–variance ratio in a Poisson distribution. When the mean–variance ratio is greater than unity, it implies overdispersion in the data (Creel and Loomis, 1990; Haab and McConnell, 2002), which is often detected in recreation trip demand. The Poisson model generates a consistent conditional mean despite overdispersion in the data, but the standard errors of  $\beta$  are biased downward (Grogger and Carson, 1991). A more generalized model to account for the overdispersed counts is based on the negative binomial probability distribution

expressed as

$$f(Z = z) = \frac{\Gamma(z + 1/\alpha)}{\Gamma(z + 1)\Gamma(1/\alpha)} (\alpha\lambda_i)^z (1 + \alpha\lambda)^{-(z+1/\alpha)}, \quad (4)$$

where,  $\Gamma(\cdot)$  is the gamma function, i.e., a discrete probability density function defined for  $z$ . Here,  $z$  is an element of a set of non-negative integers with parameters  $\alpha$  and  $\lambda$  are strictly positive. The first two moments of the negative binomial distribution are

$$E(Y|X) = \lambda = \exp(X\beta), \quad (4a)$$

$$\text{Var}(Y|X) = \lambda(1 + \alpha\lambda), \text{ where } E(Y|X) < \text{Var}(Y|X). \quad (4b)$$

When  $\alpha = 0$ , the negative binomial model is reduced to the Poisson model. Regression-based tests can be used to evaluate if overdispersion is present in the data (Cameron and Trivedi, 1998).

The economic value of nature-based recreation is obtained from the estimated demand function. In particular, the CS per predicted trip is estimated as (Creel and Loomis, 1990)

$$E(Y|X) = -1/\beta_c, \quad (5)$$

where  $\beta_c$  is the coefficient on the travel cost variable.

### 3.2. Survey design and administration

Since the primary motivation of this study was to analyze nature-based recreation demands, the study site selection was an important part of the research design. As discussed previously, we identified five recreation sites with variable levels of development (i.e., naturalness) in the Apalachicola River region.

Sampling began in September 2000 and continued until February 2001. The survey data were collected in two phases. In the first phase, recreation visitors at each of the five sites were contacted and short interviews were conducted. We used a random sampling approach to obtain a representative sample of recreation visitors. At the recreation site, every second visitor at least 18 years of age was selected by a trained interviewer for an initial interview. The main purpose of the initial interview was to obtain the preliminary information such as name, address, purpose of the trip, etc., and give each participant the survey questionnaire packet, which included a cover letter, pencil, postage-paid return envelope, and questionnaire. The questionnaire was the main data gathering tool and requested participants to identify their most satisfying recreation activities, travel costs, setting preferences, and socioeconomic characteristics. Interviewers requested participants to complete the questionnaire and mail it back to the researcher within 2 weeks. Travel costs included transportation costs and out of pocket costs including fees, lodging, food, and miscellaneous expenses.

We followed mailing procedures suggested by Salant and Dillman (1994) to maximize response rates. After a week of the first mailing the respondents were reminded of the

survey through postcards. Two more follow-up reminders were sent within 3- and 6-week intervals for those who did not return the survey. Of the 428 surveys mailed, 263 were returned resulting in a response rate of 61%.

### 3.3. Visitor characteristics and empirical model specification

Our survey results indicate that the socio-demographic characteristics of visitors in the Apalachicola River region are consistent with other visitor studies (Cordell, 1999; Shrestha et al., 2002). The majority of respondents are middle aged, well educated, male, and married with children. Nearly two-thirds of respondents live within the Apalachicola River region. The average household income of the respondents is \$45,000, slightly lower than the national average.

Most of the participants are repeat visitors to the recreation area where they were contacted. Nearly 75% of respondents visited the area at least once before, and 45.4% reported that they visited the area more than once a month (Table 1). The participants spent much time on the site. Over half of the respondents spent at least a day in the recreation area during their most recent trip.

Results show that over a third of the participants are visiting as couples. About half of the respondents are visiting with families and friends and 15.5% of them are single visitors. Few of the visitors surveyed are traveling in organized groups.

To analyze visitors' preferences for nature-based recreation and the economic value attached to recreation visits, we formulated a travel cost demand model. Following

Table 1  
Nature-based recreation visitor characteristics

Visitor characteristics	Percent (%)
<i>Visitor group type (n = 427)</i>	
Single	15.5
In couple	36.3
With friends	16.4
With family	19.6
With friends and family	11.0
In organized group	1.2
<i>Recreation visitor origin (n = 263)</i>	
Apalachicola River region	42.8
Other regions of Florida	8.8
Out of state	47.2
Out of country	1.2
<i>Frequency of visits in last 12 months (n = 426)</i>	
First time	25.0
2-3 times	14.6
4-7 times	11.0
8-11 times	4.0
12 or more times	45.4
<i>On-site time spent recreating (n = 425)</i>	
Only a few hours	20.9
Half a day	15.8
One day	18.6
More than a day	44.7

Table 2  
Variables representing nature-based recreation preferences and values

Variable	Exp. sign	Description
Recreation visit	n.a.	Dependent variable: number of visits in the past 12 months
Travel cost	–	Total trip cost in dollars
Onsite time	–	Time spent (hours) on site during the most recent trip
<i>Naturalness of the Recreation sites<sup>a</sup></i>		
Naturalness I	±	1 if visited area is highly undeveloped, 0 otherwise
Naturalness II	±	1 if visited area is relatively undeveloped, 0 otherwise
Naturalness III	±	1 if visited area is relatively developed, 0 otherwise
Naturalness IV	±	1 if visited are is moderately developed, 0 otherwise
<i>Recreation activities<sup>a</sup></i>		
Camping	±	1 if camping is rated as the most satisfying recreation activity
Hiking	±	1 if hiking is rated as the most satisfying recreation activity
Fishing	±	1 if fishing is rated as the most satisfying recreation activity
Hunting	±	1 if hunting is rated as the most satisfying recreation activity
Wildlife viewing	±	1 if wildlife viewing is rated as the most satisfying recreation activity
Boating	±	1 if boating is rated as the most satisfying recreation activity
<i>Socioeconomic characteristics</i>		
Respondent's age	±	Age of respondent in years
Respondent's education	+	1 if respondent is a college graduate, 0 otherwise
Respondent's gender	±	1 if respondent is a male, 0 if female
Household income	+	Household income of respondent (in thousand US dollars)

<sup>a</sup>Naturalness V and other recreation activities were excluded variables in the model.

Table 3  
Setting descriptions and corresponding levels of naturalness

Naturalness level	Setting description
I	A totally undeveloped area with no facilities
II	A relatively undeveloped area featuring trails, signs, trailhead parking, primitive camping
III	A slightly developed recreation area featuring unpaved sightseeing roads, car campgrounds with limited facilities, scenic rest stops/turnouts, vista points, picnic areas
IV	A moderately developed recreation area featuring developed public and private campgrounds, paved roads, stores for supplies and food
V	A highly developed recreation area featuring RV camping, public campgrounds, hotels, paved road system, stores, tour guides, and visitor centers

Hellerstein (1991) and Creel and Loomis (1990) we specified our model with travel cost, time, income, and site characteristics as important explanatory variables (Table 2). Smith and Kopp (1980) suggest that the visitors recreating in unique natural areas are more likely to travel longer distances and spend more time on site. To control for this effect we included on-site time in the travel cost demand model.

To explicitly account for recreation visitors' preferences for natural settings in their trip demand, respondents were asked to identify their setting preferences (in terms of level of naturalness). Participants were given a description of

each setting level (Table 3) and asked to identify the type of setting they most often visited in the region. The five setting descriptions served as our Naturalness variables and ranged from Level I (totally undeveloped) to Level V (highly developed). We also examined the impact of actual recreation site variables instead of using the Naturalness variables in the analysis.

The recreation activities that respondents' rated as their most satisfying in their recent trip were also included in the model. Camping, hiking, fishing, hunting, wildlife viewing, and boating were the most preferred recreation activities in the region. Socioeconomic variables were identified as gender, age, education, and income. The descriptive statistics of the variables included in our recreation demand model are presented in Table 4.

#### 4. Recreation demand model results and discussion

We estimated the Poisson count and negative binomial models to analyze the nature-based recreation demand and visitor preferences for the level of naturalness on site. Nearly half of the variables in the Poisson count model were statistically significant at a probability value of  $p < 0.05$  (Table 5). Just above 22% variability in the recreation trip is explained by the variables included in the model as indicated by deviance- $R^2$  value. However, variance–mean ratio of the recreation trip variable and regression-based overdispersion test clearly indicated a presence of overdispersion in our recreation demand model. The variance–mean ratio was 256 (see Table 4), which may not converge to unity even with the inclusion of

Table 4  
Descriptive statistics of the variables included in the travel cost model estimated for Apalachicola River region

Variable	Mean	Std. dev.	Minimum	Maximum
Travel cost	110.45	168.39	0.00	800.00
On-site time	11.77	6.82	2.00	18.00
Naturalness I	0.16	0.37	0.00	1.00
Naturalness II	0.16	0.36	0.00	1.00
Naturalness III	0.29	0.46	0.00	1.00
Naturalness IV	0.21	0.41	0.00	1.00
Camping	0.12	0.33	0.00	1.00
Hiking	0.12	0.33	0.00	1.00
Fishing	0.22	0.42	0.00	1.00
Hunting	0.04	0.19	0.00	1.00
Wildlife viewing	0.08	0.28	0.00	1.00
Boating	0.03	0.18	0.00	1.00
Respondent's age	51.47	16.78	0.00	84.00
Respondent's education	0.41	0.49	0.00	1.00
Respondent's gender	0.67	0.47	0.00	1.00
Household income	45.53	40.13	0.00	150.00

Std. dev. is standard deviation.

regressors in the Poisson model. The likelihood ratio test resulted in a  $\chi^2$  value of 835.77 (Table 5), which exceeded the critical value of  $\chi^2_{(1, 0.01)} = 6.63$  at  $p < 0.01$ , strongly rejecting the null hypothesis of equidispersion. Thus, we present the negative binomial model results for the subsequent discussions. We verified our results with the results from truncated count data models to account for potential non-visitor biases in our recreation trip data, but the sign and significance of the coefficients did not improve.

The coefficient on the travel cost variable is negative and statistically significant showing recreation visitors take fewer trips when the trip cost is high, a consistent result required for downward sloping demand functions. The variable representing totally undeveloped sites (Naturalness I) carries a positive sign and is significant at  $p \leq 0.05$ . This suggests that the respondents who most often visit undeveloped recreation sites in the Apalachicola River region show higher recreation trip demand. However, this result does not hold for moderately undeveloped (Naturalness II) sites as the coefficient on this variable is insignificant with a negative sign. The insignificant inverse relationship of recreation trip demand continues to hold in the case of the slightly developed (Naturalness III) and moderately developed (Naturalness IV) sites of the region. Visitors' preferences for the highly developed (Naturalness V) sites was the excluded variable. We also analyzed the effects of naturalness in recreation travel demand using actual site-specific dummy variables representing St. Vincent NWR, Tate's Hell State Forest, Apalachicola River WEA, and Apalachicola National Forest at a descending order of naturalness, but the results did not improve.

Table 5  
Travel cost model showing nature-based recreation demand in Apalachicola River region<sup>a</sup>

Variable	Poisson count		Negative binomial	
	Coefficient	Std. error	Coefficient	Std. error
Travel cost	-0.0011**	0.0002	-0.0013**	0.0004
On-site time	0.0003	0.0002	0.0003	0.0006
Naturalness I	0.4510**	0.0644	0.4916*	0.2191
Naturalness II	-0.1303	0.0765	-0.1871	0.2192
Naturalness III	-0.1039	0.0670	-0.1185	0.1898
Naturalness IV	0.0756	0.0705	0.1353	0.2095
Camping	-0.2391**	0.0837	-0.1961	0.2088
Hiking	0.0890	0.0713	0.0691	0.2074
Fishing	0.3072**	0.0531	0.3499*	0.1667
Hunting	0.0270	0.1044	-0.1112	0.3583
Wildlife viewing	-0.1571	0.0949	-0.1917	0.2411
Boating	0.5692**	0.0984	0.7240*	0.3711
Respondent's age	0.0019	0.0013	0.0014	0.0039
Respondent's education	-0.2890**	0.0480	-0.3681**	0.1396
Respondent's gender	-7.3E-05	0.000216	6.74E-05	0.000671
Household income	0.0001	0.0006	0.0014	0.0017
Constant	2.27823**	0.09373	2.27138**	0.267487
Alpha	—	—	0.740633**	0.091779
Deviance- $R^2$ ( $R^2D$ )	0.22		—	
$\chi^2$	429.99		835.77	
Log likelihood function	-1191.56		-773.76	
Sample size	237		237	

\*\*Indicates the coefficient significant at probability value  $p < 0.01$ .

\*Indicates the coefficient significant at probability value  $p < 0.05$ .

Std. error is standard error.

<sup>a</sup>Regression models were estimated using Limdep version 8.0 (Greene, 2002, Econometric Software, Inc., Plainview, NY, USA).

The preference of nature-based tourists for various recreation activities was measured using their highest level of satisfaction with the trip in the Apalachicola River region. Fishing, camping, and hiking were most often rated as participants' most satisfying recreation activities—25.7%, 16.5%, and 13.9% of study respondents reported fishing, camping, and hiking as the most satisfying recreation activities, respectively. In terms of the relationships between visitors' satisfaction with their recreation activities and their trip demand, the model results indicate only fishing and boating as statistically significant variables with positive signs on the coefficients of both variables. This result suggests that respondents who find fishing and boating as the most satisfying recreation activities reveal higher recreation trip demand in the Apalachicola River region.

Among socioeconomic variables, only respondents' education was a significant predictor of recreation trip demand. The results indicate that frequent visitors are relatively less educated. Household income and male

respondents might have a positive influence on trip demand, but the relationship is not deterministic. We included the variable representing on-site time to account for the effects of recreation visitors taking relatively fewer trips but spending more time on-site. However, the coefficient on on-site time was insignificant.

We estimated the economic value of nature-based recreation visits in the Apalachicola River region using the negative binomial recreation trip demand model (Table 5). The estimates show an average CS of \$787.76 per trip with 95% confidence interval of \$487.81–\$2045.56. A relatively high CS per trip in our study may be attributable to multi-day trips. Using mean length of the recreation trip in days, we obtain a more reasonable CS estimate per day of \$74.18. Because of the relatively pristine natural areas and remote sites in our study multi-day trips are expected.

The CS estimates indicate a relatively high economic value of nature-based recreation in the Apalachicola River region compared to the outdoor recreation value estimates reported in past studies. For example, Shrestha and Loomis (2003) conducted a meta-analysis of outdoor recreation economic values of the past 30 years in the US and found a mean predicted CS value of \$47.10 per day with the original values extracted from existing recreation valuation studies ranging between \$1.97 and \$116.78. Past studies also indicated that pristine natural resources and wilderness sites are highly valuable. Loomis (2000) reported about two dozen wilderness recreation studies with the values ranging up to \$218 per day. In a recent study, Park et al. (2002) reported \$481.15 per trip CS value of snorkeling trips in Florida Keys using the travel costs method. A high recreation value of this well-known ecosystem may be expected. The authors reported \$207 per day trip for visitors who plan to increase their visits in Florida Keys. Perhaps, potential multipurpose trips taken to the Apalachicola river region (e.g., visiting families and multiple recreation sites) may have contributed to the relatively high CS estimate in our study, but we have no information to account for this phenomenon. Overall, our CS estimates are within the range of recreation values estimated elsewhere in Florida and with those associated with wilderness and other pristine areas in the US.

Using the mean CS value estimated from the random sample of nature-based recreation visitors in the Apalachicola River region, we estimated the total recreation value of the resource. Using the annual estimated recreation visits of 615,117 in the region for the fiscal year July 2000–June 2001, the economic value of nature-based recreation in the region is estimated to be \$484.56 million with 95% confidence interval of \$300.06–\$1258.26 million (Table 6). The recreation visitor data indicate that Apalachicola National Forest and St. George Island State Park receive most of the visitors among the sites included in the study representing 64% and 23%, respectively, thus disproportionately influencing the total value estimate. While adjusting the values for response rates obtained in

Table 6

Economic value of nature-based recreation in Apalachicola River region (in thousand US dollars)

Recreation site	Response rate (%)	Annual visits <sup>a</sup>	Recreation value	Adjusted value <sup>b</sup>
St. Vincent NWR	74	8000	6302	4664
Tate's Hell State Forest	45	5000	3939	1772
Apalachicola River WEA	45	66,217	52,163	23,473
Apalachicola National Forest	57	393,400	309,903	176,645
St. George Island State Park	68	142,500	112,255	76,333
Total		615,117	484,562	282,887

<sup>a</sup>Average trip length is 10.62 days based on survey data.

<sup>b</sup>Values are based on the results from negative binomial model and adjusted to the response rates obtained in each nature-based recreation site.

our survey we estimate a total value of \$282.89 million, which would provide a lower bound estimate of the total economic value.

## 5. Conclusions

Our analysis of nature-based recreation visitors' trip behavior and preferences suggest that there is a high demand for pristine natural areas for recreation visits in the Apalachicola River region of Florida. Although nature-based tourism is a growing concept in the state, public land managers often add infrastructure and improve visitor access in order to increase recreation visits on these sites. If the goal of managers is to increase visitors, this added development might achieve that goal. However, if managers would like to plan for the economic value of nature-based recreation in their regions, this study shows more development is not necessarily required. Study participants who said they most often visit the most undeveloped type of settings also said they visit the region more frequently than visitors who visit more developed recreation areas. This implies that managers can enhance the value of nature-based recreation in the Apalachicola River region if they increase the opportunities for visitors to experience more pristine recreation areas.

In most cases, these areas exist, but it is likely that potential nature-based visitors do not know about these areas. Providing information is important in helping visitors get into these undeveloped areas. As defined by Knopf (1989, p. 641) "Marketing... has to do with creating a fit between people and the environment." Therefore, managers must work to create this fit through improved promotion of undeveloped natural areas to recreationists who place value on those areas. Since not all nature-based visitors will find undeveloped recreation areas highly desirable, increased research is needed to identify who these recreationists might be and how information can be



most efficiently provided to them in order to increase visitation to natural areas.

These results also suggest that public land managers might need to rely more on local outfitters and guides to help people access undeveloped areas. As is the case with St. Vincent National Wildlife Refuge, visitors hire local guides to take them in a motorboat to the refuge. If visitors are likely to visit undeveloped areas more often then there will be a greater demand for local guides to help visitors access these natural areas. Public land managers are unlikely to provide this assistance, so they must work with local communities and businesses to develop these guiding opportunities.

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