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Visitor Preferences and Values for Water-Based Recreation: A Case Study of the Ocala National Forest

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We used the open-ended contingent valuation method to elicit willingness to pay (WTP) for day visitors and extended visitors on the Ocala National Forest (ONF), Florida. A Tobit model specification was applied to account for the issues involved with censored WTP bids. The results reveal that visitors would pay more for improved recreational facilities at the ONF. In particular, our estimates show that visitors would pay $1 million for basic facilities, $1.9 million for moderate improvements, and $2.5 million for more improvements.

Key Words: contingent valuation, Tobit analysis, water-based recreation

JEL Classifications: Q23, Q26

A recent inventory of the American public shows that the majority of citizens participate in some form of outdoor recreation (Cordell et al.). Furthermore, more than half of the people living in the southern United States visit nature centers, drive for pleasure, and go sightseeing (Cordell). In the United States, federal land-management agencies manage more than 650 million acres of public land, most of which is open to the public for recreation. Because of the large supply of open natural areas, many people believe the term "great outdoors" refers to national forests, national parks, or other public lands (Betz, English, and Cordell).

By managing almost one third of federal lands in the United States, the U.S. Department of Agriculture Forest Service (USDA FS) recorded over 850 million visits in 1996.[1] The FS continuously struggles to balance this overwhelming recreation demand with other demand for timber, minerals, and grazing facilities. However, researchers have shown that nature-based recreation participation will continue to grow, creating even greater demand for recreation and other leisure activities in na-

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[1] The USDA Forest Service manages more than 29% of the 652 million acres of federal public land, and 43% of the 29.8 million acres of the public land that is in the southern United States (Betz, English, and Cordell).

tional forests. In fact, on the basis of participation rates in 1995, Bowker, English, and Cordell estimated that the number of people camping in developed sites and picnicking and sightseeing in the southern United States is expected to almost double by 2050.

Not only is the number of visitors increasing, but USDA FS visitors also have diverse backgrounds and interests, resulting in a greater variety of desired recreation opportunities (Brown, Driver, and McConnell; Stein and Lee; Wagar). Although research has shown that the desire to experience nature is a primary reason for recreating in a natural area, visitors rarely look for the most primitive setting (Stein and Lee; Virden and Knopf). Many people require easy access and some level of development for them to visit and to recreate in a national forest or other public natural areas. Much research has examined visitations to undeveloped recreation sites on public lands, but little research has been done on visitors' preferences and values for developed water-based recreation areas. Also, research has not fully examined visitors' willingness to pay for more developed recreation opportunities, which are rarely considered to exist on USDA FS lands. As a result, the FS is unable to make informed management and budget decisions regarding appropriate facilities in many of its heavily used recreation sites.

In this article, we analyze visitors' preferences for incremental facilities at water-based recreation sites in the Ocala National Forest (ONF), Florida. Specifically, we estimate visitors' willingness to pay (WTP) for water-based recreational activity coinciding with various levels of on-site facilities. We achieve this goal using the contingent valuation method (CVM), an established method for nonmarket valuation of natural resources and environmental goods (Boyle, Reiling, and Phillips; Loomis and Walsh; Mitchell and Carson).[2] An open-ended CVM question format was used to elicit visitors' WTP for water-based recreation under current facilities and for improved facilities. The open-ended format of CVM works relatively well in cases where respondents are familiar with the resource and with the concept of purchasing similar types of goods and services (Halstead, Lindsay, and Brown; Mitchell and Carson). Several advantages of an open-ended CVM design were discussed by Halstead, Lindsay, and Brown, although its use has declined in recent years. Our choice of the open-ended CVM was mainly determined by the requirement of relatively smaller datasets, thereby saving time and expense. Because a mail-back questionnaire was used and respondents were quite familiar with the recreation facilities referred to in the survey, we believed that the open-ended CVM would provide reasonable estimates of benefit values. However, as past studies have suggested, we expect that the WTP values obtained using this method are likely to be smaller, thus serving as lower bound estimates (Hoehn and Randall; Shrestha and Loomis; Walsh, Johnson, and McKean).

The survey was conducted for two distinct visitor groups. The first group included day visitors taking mostly a day trip to the recreation site, and the second included extended visitors planning a trip for much longer than a day. We anticipated that those two visitor groups would have different preferences and WTPs for the recreation opportunity. We tested for the differences in visitors' WTP for recreation with variable facilities at the site. Finally, the total benefits of water-based recreation on the ONF under current and improved levels of facilities were derived.

The plan of the article is as follows. The following section is devoted to the methodology and approach of the study. Survey design is discussed in the third section. In the fourth section, we present results and discussion. Summary and conclusions are provided in the final section.

Methodology and Approach

The CVM is used primarily to elicit nonmarket values of natural resources and environ-

[2] A comprehensive collection and synthesis of recreation valuation literature relating to the United States was recently published in this journal (Rosenberger and Loomis).

mental goods and services. In a typical open-ended CVM study, the respondents are asked to state their WTP for a particular nonmarket good or amenity in question. With valid responses from a random sample of respondents, researchers are able to estimate the economic value of the resource in terms of Hicksian consumer surplus, called compensating variation (CV) or compensating surplus (Mitchell and Carson). In terms of utility theory, each consumer's WTP for water-based recreation opportunities with improved facilities can be represented by

$$\begin{aligned}(1)\quad \mathrm{WTP}_i &= f(q, Y, T)\\ &= [e_i(p^0, q^0, U^0) = Y^0]\\ &\quad - [e_i(p^0, q^1, U^0) = Y^1],\end{aligned}$$

where WTP_i is willingness to pay of visitor i, q represents the quantity or quality of recreation goods ($q^0 < q^1$, recreation with improved facilities represented by q^1), Y is the minimum income necessary to maintain utility given constant prices and quantities of other goods, T is a vector of socioeconomic and preference factors that influence the preferences of visitor i, U^0 represents the visitor's initial utility, and $e_i(\cdot)$ is the visitor's expenditure function. All else equal, if $Y^1 < Y^0$, q^1 is preferred to q^0, and the visitor would be willing to pay more in terms of compensating surplus (variation) for the recreation opportunity up to the point that the utility is unchanged. Conversely, if $Y^1 > Y^0$, q^1 is not preferred to q^0, which implies nonpositive compensating surplus and thus zero WTP (the welfare change is negative and compensation is needed to establish consumer's initial welfare position). In such corner solution cases, the visitor reports no visitor surplus for the additional facilities offered in q^1 (Goodwin et al.; Halstead, Lindsay, and Brown).

In our empirical case study, WTP bids were measured through the CVM survey, and the internal validity of the WTP responses were evaluated using econometric analysis. In many cases, open-ended CVM bids are analyzed using standard ordinary least-squares (OLS) regression. Yet, one of the issues involved in an open-ended CVM is that the respondents might report zero WTPs, which leads to the corner solution implied by zero bids (Goodwin et al.; Halstead, Lindsay, and Brown; Smith). The zero bid in an open-ended CVM is recognized as censoring in recreation demand models. Failure to account for the censored sample of WTP bids would lead to biased and inconsistent estimates of model parameters (Goodwin et al.; Greene; Halstead, Lindsay, and Brown; Maddala; Norris and Batie; Ziemer and White). To address these statistical issues, we have estimated a Tobit regression model to analyze visitors' WTP responses.

The Tobit model specification is given by the following censoring rule

$$(2)\quad y_i = \begin{cases} y_i^* & \text{if } y_i^* > 0,\\ 0 & \text{otherwise,}\end{cases}$$

where y_i is the stated WTP of recreation visitor i and y_i^* is the corresponding latent value of the visitor's willingness to pay. This expression represents the situation in which zero responses are generated from the same process as nonzero responses that represent compensating surplus (variation) (Goodwin et al.). The expected value of the latent variable y_i^* and the marginal effects in the model are expressed as

$$(3)\quad E(y_i^* \mid \mathbf{x}_i) = \beta' \mathbf{x}_i$$

$$(4)\quad \partial E(y_i^* \mid \mathbf{x}_i)/\partial \mathbf{x}_i = \beta.$$

The Tobit model represents the expected value of the censored variable y_i as

$$(5)\quad E(y_i \mid \mathbf{x}_i) = \beta' \mathbf{x}_i F(z) + \sigma f(z),$$

where $z = \beta' \mathbf{x}_i/\sigma$, $f(z)$ is the density function, $F(z)$ is the cumulative distribution function of a standard normal random variable, and σ is the standard deviation. Then, the marginal effects in the model are given by

$$(6)\quad \partial E(y_i \mid \mathbf{x}_i)/\partial \mathbf{x}_i = F(z)\beta.$$

Furthermore, McDonald and Moffitt suggested

useful decomposition of the marginal effects of Tobit model into two distinct components

$$(7)\quad \frac{\partial E(y_i|\mathbf{x}_i)}{\partial \mathbf{x}_i} = P(y_i > 0)\left[\frac{\partial E(y_i|\mathbf{x}_i, y_i > 0)}{\partial \mathbf{x}_i}\right] + E(y_i|\mathbf{x}_i, y_i > 0)\left[\frac{\partial P(y_i > 0)}{\partial \mathbf{x}_i}\right]$$

$$(8)\quad \frac{\partial E(y_i|\mathbf{x}_i, y_i > 0)}{\partial \mathbf{x}_i} = \beta\left[1 - \frac{zf(z)}{F(z)} - \frac{f(z)^2}{F(z)^2}\right]$$

$$(9)\quad \frac{\partial P(y_i > 0)}{\partial \mathbf{x}_i} = \frac{f(z)\beta}{\sigma}.$$

Equation (7) has two terms on its right-hand side. The first term denotes the change in y_i of those above the limit weighted by the probability of being above the limit, whereas the second term represents the change in the probability of being above the limit weighted by the expected value of y_i above the limit. The expressions in Equations (8) and (9), therefore, represent the change in y of those observations with positive WTP bids and the change in the probability of eliciting positive bids, respectively.

Survey Design

A recreation visitor survey was conducted on the ONF, one of three national forests in Florida, which covers 383,220 acres. The ONF supports a variety of recreation activities, of which water-based recreation activities are predominant because of the existence of unique natural springs. The diverse ecological sites and water resources of lakes, swamps, wetlands, and springs of the ONF provide opportunities for numerous recreation activities such as boating, canoeing, swimming, fishing, and wildlife viewing. The major water-based recreation sites considered for this study are Sweetwater Springs, Silver Glen Springs, Juniper Springs, and Salt Springs. These springs attract approximately 212,000 visitors every year. Despite great interest in the springs, the USDA FS has limited information about visitors' preferences for various water-based recreation activities and facilities at these sites.

In our case study, the CVM survey instrument was designed to focus on three major areas: (1) description of the facilities and proposed improvements, (2) WTP questions, and (3) visitors' socioeconomic characteristics.[3] We have also added questions to reveal visitors' preferences, to evaluate how those preferences influence WTP bids.

The survey was conducted between May and August 2000. Researchers kept in mind the potential differences between the two visitor groups, i.e., day and extended visitors, in their preferences and values. Specifically, the visitors were asked to state their WTP for the recreation facilities under three management scenarios, using CVM questions (Table 1). The first scenario consisted of the minimally developed existing facility and structures at the springs. Respondents were asked what their maximum WTP above the expenditure incurred for the trip would be for such a site. In the subsequent two questions, the site descriptions were given, with some additional improvements in the facilities to reflect the moderately developed and more developed facilities, and again respondents were asked questions to elicit their WTP to visit such a site. Site improvements included facilities, interpretive services, recreation opportunities, accommodations, food and supplies, and recreation equipment rentals (Table 1).

In our survey, we defined Treatment A as a base case having the current level of facilities, recreation opportunities, food and supplies, and rentals. Treatment B had moderate improvement in facilities, food, and supplies, and new interpretive activities and overnight accommodations. Treatment C was defined with more improvements—i.e., improvements above those of Treatment A and B. The three scenarios given to the respondent clearly indicated the continuum of facility improvements from less- to more-developed sites. However, the WTP value elicited in each scenario would be a measure of the site with as-

[3] This survey format is consistent with the basic CVM survey design suggested by Mitchell and Carson with three major parts—namely, description of goods being valued, elicitation of WTP, and respondents' characteristics.

Table 1. Differential On-site Facilities Proposed in the Survey

On-site Facility	Treatment A: Current Facility	Treatment B: Moderately Improved Facility	Treatment C: More Improved Facility
1. Facilities	Flush room, picnic tables	Treatment A1, plus shower at campground, daytime boat, and parking dock	Treatment B1, plus children's play area and game room with video games
2. Recreation opportunities	Swimming, volleyball, snorkeling, sunbathing, canoeing, hiking, picnicking	Same as Treatment A2	Same as Treatment B2
3. Food and supplies	Snack and drink vendors	Treatment A3, plus basic groceries and camping equipment	Treatment B3, plus restaurant
4. Rentals	Snorkels, fins, and canoes	Same as in Treatment A4	Treatment B4, plus paddle boats and inner tubes
5. Interpretive activities	None	Daytime interpretive tour	Treatment B5, plus weekend interpretive tours, more hiking, and boardwalk trails
6. Overnight accommodations	None	Tent and RV camping area	Treatment B6, plus rental cabin and overnight boat parking

signed facilities in a bundle. We kept recreation opportunities constant across the treatments. The same treatments were used for both day and extended visitors to maintain consistency in our comparison of the two types of responses. For notational clarity, we assigned the variables A_{DV}, B_{DV}, and C_{DV} for day visitors and treatments A_{EV}, B_{EV}, and C_{EV} for extended visitors.

In the ONF, day visitors are primarily interested in activities that require easy access to a specific natural attraction (e.g., springs). Because day visitors require less infrastructure to facilitate their recreation motivations, it is likely that they would be less willing to pay for facilities that they would not fully use or desire. However, extended visitors, who apply for a cabin, are likely to spend more time recreating in the forest and therefore may prefer more facilities on site. Thus, it is possible that the two groups of visitors would have differences in their preferences with respect to site management, improvement, and their willingness to pay for recreation opportunities.

More day visitors visit ONF in the months of May through September, when our survey was conducted. In the survey process, day visitors were contacted randomly at all three sites (Silver Glen Springs, Salt Springs, and Juniper Springs) in the ONF for their permission to participate in the study. The visitors were contacted on weekdays early in the survey. But, because of low visitation rates during weekdays, later surveys were conducted during weekends. A brief on-site survey was administered to each participant to get contact information, and then a questionnaire packet with a cover letter, a pencil, and a self-addressed return envelope was handed out on site. The visitors were requested to complete the questionnaire and mail it back to the researcher.

The survey of extended visitors was conducted separately on the basis of their interest

to rent a Sweetwater Springs cabin. The Sweetwater Springs cabin was the only cabin available to visitors in the ONF during our survey, which accommodates no more than two families. Therefore, not all applicants can have access to the Sweetwater Springs cabin. This implies that extended visitors include individuals who indicated their desire for taking a longer recreational trip to the ONF. The sample of the extended visitors was drawn from a list of names and addresses provided in the 1999 Sweetwater Springs cabin lottery. A week prior to mailing the questionnaire to participants, researchers sent a letter notifying participants that they had been selected for the survey because of their interest in the Sweetwater Springs cabin. The survey questionnaire was mailed to participants a week later. Participants who did not respond received a reminder postcard a week after the initial mailing and then a second reminder letter accompanied by another questionnaire. Finally, a third mailing that included a questionnaire and cover letter was sent to the respondents who had not yet completed the survey.

Out of 437 surveys mailed, 69% were returned by extended visitors, whereas 40% of the 360 day visitors responded. A higher response rate of extended visitors may be partly due to the follow-up mailings. Furthermore, in revealing a higher response rate, extended visitors probably place a greater stake in the recreation opportunities in question. Not only are they likely to devote more time planning for the trip to the ONF than day visitors, extended visitors would also spend more time on site. Our survey response rates of 40% and 69% are within the range of similar recreation valuation surveys conducted in the past (Loomis and Walsh).

Empirical Results and Discussion

Water-based recreation visitors' WTP for recreation opportunities on the ONF under varying levels of on-site facilities development were analyzed. To preserve potential differences in preferences and motives of visitors, we used a dummy variable approach to categorically analyze their responses. For both day and extended visitors, WTP responses were analyzed for three treatment effects. These distinctions were important to our analysis, because we expected differences between the two groups of visitors across the treatments in their preferences and WTP values.

Regression Results

Analyses of WTP for water-based recreation were performed using the Tobit model. The variables included in the regression models are defined in Table 2. Our regression model data set included both day visitors and extended visitors. Model I consisted of responses from both visitor groups for A_{DV} and A_{EV}, model II combined B_{DV} and B_{EV}, and model III included C_{DV} and C_{EV}. As noted above, visitor group effects were separated by a dummy variable. Assumptions of the classical linear regression model were examined. We found no serious violations that would alter our model results.[4]

The explanatory variables were separated into socioeconomic and preference variables. Inclusion of the socioeconomic variables in the model is a common practice for analyzing WTP responses in recreation demand models. In addition to income, age, education, and sex, site-specific variables (visiting in an organized group, number of visits, and visitor type—i.e., extended vs. day visitors) were also included in the regression models. Moreover, we were also interested in analyzing some of the influences of the visitors' preference variables as explanatory factors of the WTP bids. It has often been reported that visitors' preference or motivation factors are important in recreation demand analysis (Driver, Douglass, and Loomis). The preference variables included in our models were expected future visits to the natural areas, willingness to travel longer distances for recreation, amount of time spent on site, preference to visit with family, preference to take a trip to enjoy nature, and preference

[4] No serious collinearity exists in the dataset, for example, pairwise correlation between variables *VISITS* and *EXPTRIP* was less than −0.12 across all models. When corrected for heteroscedasticity, the significance of most explanatory variables remained unchanged.

Table 2. Definition of the Variables Used in Regression Analysis

Variable	Expected Sign	Definition
WTP		Dependent variable of the model representing net willingness to pay (WTP above and beyond the trip cost) per trip for a recreation opportunity with varying levels of facilities for water-based recreation in ONF
Socioeconomic variables		
GROUP	+	1 if the trip to ONF was taken in an organized group, 0 otherwise
GENDER	±	1 if the respondent is a male, 0 if female
INCOME	+	Household income of the respondent per year in thousand U.S. dollars
EXTVIS	+	1 if the respondent is an extended visitor at ONF, 0 otherwise
VISITS	−	1 if the respondent's annual number of trips to natural areas in Florida was 4 or more, 0 otherwise (average annual visits, range 4–6)
Preference variables		
EXPTRIP	−	1 if the respondent expects to visit natural areas in Florida more frequently in next 12 months, 0 otherwise
TRAVEL	+	1 if the respondent was willing to travel 65 miles or more for a water-based recreation trip, 0 otherwise (average travel mileage range 65–100)
ONSITE	−	1 if the respondent was willing to spend not more than a day on-site in a water-based recreation trip, 0 otherwise
FAMILY	±	1 if the respondent's preference was to bring family closer in this trip (i.e., if it was rated as very important or extremely important), 0 otherwise
ENJOY	−	1 if the respondent's preference was to enjoy natural scenery in this trip (i.e., if it was rated as very important or extremely important), 0 otherwise
LEARN	−	1 if the respondent's preference was to learn more about natural phenomena in this trip (ie., if it was rated as very important or extremely important), 0 otherwise

to visit the site for learning about nature. In Table 2, the sign next to each variable indicates the expected relationship between explanatory variables and visitors' WTP bids.

Table 3 reports the derivatives of the expected value of latent variable y_i^* and the derivatives of the expected value of the censored variable y_i for the three different models.[5] The marginal effects are decomposed, as defined in Equations (7)–(9). Signs and significance of coefficients of explanatory variables are found as expected (Table 3). Coefficients of all preference variables in models I and II are significant at the 10% or better level, indicating strong support for visitors' preferences and motivation factors significantly influencing their WTP bids. The coefficient of variable *GROUP* is positive and significant across all three models, which implies that visitors recreating in an organized group have higher WTP values. Male visitors have significantly lower WTP than females, as revealed by the *GENDER* variable (models I and II).

Similarly, *INCOME* is significant in models I and II, which implies that visitors with higher income would pay more, an expected result. *EXTVIS* is significant and positive in models I and III, indicating that extended visitors have significantly higher WTP than day visitors, as expected. *VISITS* is negative and significant across all models, which suggests that more frequent visitors have lower WTP per trip, although their annual WTP may be higher because they would take more frequent trips.

Among preference variables, increased expected visits (*EXPTRIP*) revealed a lower

[5] We verified our Tobit model results with OLS results and found that the log-likelihood function values were consistently higher in Tobit specification across all treatments. Our OLS models have adjusted R^2 of 0.20, 0.13, 0.10 for models I, II and III, respectively.

Table 3. Tobit Regression Results of Recreation Visitors' WTP Across Three Alternative Treatments

	Model 1: Current Facility			
Variable	$\partial E(y_i^*)/\partial x_i$	$\partial E(y_i)/\partial x_i$	$\partial E(y_i \mid x_i, y_i > 0)/\partial x_i$	$\partial P(y_i > 0)/\partial x_i$
GROUP	11.4310**	8.9761	6.4922	0.3732
	(2.5639)			
GENDER	−2.5749**	−2.0219	−1.4624	−0.0841
	(1.0128)			
INCOME	0.0335**	0.0263	0.0190	0.0011
	(0.0124)			
EXTVIS	2.3263**	1.8267	1.3212	0.0760
	(1.0411)			
VISITS	−2.5197**	−1.9786	−1.4311	−0.0823
	(1.0475)			
EXPTRIP	−2.0441*	−1.6051	−1.1609	−0.0667
	(1.0540)			
TRAVEL	3.3169**	2.6045	1.8838	0.1083
	(1.0786)			
ONSITE	−3.9227**	−3.0803	−2.2279	−0.1281
	(1.0632)			
FAMILY	−3.9115**	−3.0715	−2.2215	−0.1277
	(1.3108)			
ENJOY	5.7539**	4.5182	3.2679	0.1879
	(2.6701)			
LEARN	1.8638*	1.4636	1.0586	0.0609
	(1.0477)			
Constant	4.0518	—	—	—
	(3.1416)			
Log likelihood	−1244.09	—	—	—
σ	8.9418	—	—	—
N	350	—	—	—

Note: Values in parentheses are standard errors of coefficients.
* indicates t-statistic significant at 0.10 or better; ** Indicates t-statistic significant at 0.05 or better.

WTP, and the coefficients were significant across all models. This suggests that visitors who expect to take more frequent trips to recreation sites are likely to pay less per trip for water-based recreation site improvement, a result consistent with the *VISITS* variable. Visitors willing to travel longer distances (*TRAVEL*) had a higher WTP, and the coefficients were also significant across all models. Visitors intending to spend a shorter amount of time on site (*ONSITE*) had a lower WTP.

Visitors having a higher preference to bring their family (*FAMILY*) to the recreation site had a lower WTP, which may be due to higher trip costs or lower consumer surplus per trip. However, visitors with a higher preference to enjoy natural scenes (*ENJOY*) and learn more about natural phenomena (*LEARN*) had a higher WTP. People with these motivations generally do not need more developed facilities, but their higher WTP would be potentially reflecting the demand for more supportive facilities in the recreation sites.

We measured the marginal effects of explanatory variables on expected WTP using the McDonald and Moffitt decompositions (Table 3). For example, the marginal effect of the *INCOME* variable in Model I is interpreted as follows: a $1,000 increase in annual income of visitors would result in a 0.11% increase in the probability of a positive WTP, a $0.019 increase in WTP for visitors with a positive WTP, and a $0.026 increase in WTP for all visitors, a result consistent with the findings of

Table 3. (Extended)

Model II: Moderately Improved Facility				Model III: More Improved Facility			
$\partial E(y_i^*)/\partial x_i$	$\partial E(y_i)/\partial x_i$	$\partial E(y_i \mid x_i, y_i > 0)/\partial x_i$	$\partial P(y_i > 0)/\partial x_i$	$\partial E(y_i^*)/\partial x_i$	$\partial E(y_i)/\partial x_i$	$\partial E(y_i \mid x_i, y_i > 0)/\partial x_i$	$\partial P(y_i > 0)/\partial x_i$
10.4671**	8.6453	6.1974	0.2349	13.4362**	10.8311	7.9202	0.2168
(3.2823)				(5.2649)			
−2.6913**	−2.2229	−1.5935	−0.0604	−2.1877	−1.7635	−1.2896	−0.0353
(1.2987)				(1.9951)			
0.0293*	0.0242	0.0173	0.0007	0.0086	0.0069	0.0051	0.0001
(0.0159)				(0.0247)			
1.3634	1.1261	0.8072	0.0306	3.8278*	3.0856	2.2563	0.0618
(1.3335)				(2.0266)			
−4.7459**	−3.9199	−2.8100	−0.1065	−6.8939**	−5.5573	−4.0637	−0.1112
(1.3421)				(2.0736)			
−3.1633**	−2.6127	−1.8729	−0.0710	−4.0011*	−3.2253	−2.3585	−0.0645
(1.3569)				(2.1075)			
3.0441**	2.5143	1.8024	0.0683	4.2619*	3.4356	2.5123	0.0688
(1.3295)				(2.3549)			
−4.5596**	−3.7660	−2.6997	−0.1023	−5.1403	−4.1436	−3.0300	−0.0829
(1.8735)				(3.3294)			
−4.8827**	−4.0329	−2.8910	−0.1096	−5.7586**	−4.6421	−3.3945	−0.0929
(1.7217)				(2.6973)			
6.5761*	5.4315	3.8936	0.1476	1.5074	1.2151	0.8886	0.0243
(3.3689)				(4.7660)			
2.3548*	1.9450	1.3943	0.0528	3.4780*	2.8037	2.0502	0.0561
(1.3410)				(2.0633)			
7.9014**	—	—	—	16.8524**	—	—	—
(3.8285)				(5.6115)			
−1317.87	—	—	—	−1341.82	—	—	—
11.4485	—	—	—	16.9003	—	—	—
344	—	—	—	316	—	—	—

Halstead, Lindsay, and Brown, and Norris and Batie. All other variables are intercept shifters. The marginal effect of these discrete variables can be interpreted as, e.g., extended visitors (*EXTVIS*, model I) are 7.6% more likely to have a positive WTP and would pay $1.32 more if they have a positive bid and $1.83 more overall at the margin compared with day visitors.

Testing for Differences in Mean Willingness to Pay

Three treatment effects are examined using analysis of variance (ANOVA) to measure variations in the mean WTP of visitors as facilities improve in each treatment. For our analysis, the mean WTP of each treatment may be represented by μ_i. Then the testable hypothesis is

$$(10) \quad H_0: \ \mu_1 = \mu_2 = \cdots = \mu_k,$$

$$H_1: \ \text{at least one of the } \mu_i \text{ is different.}$$

This hypothesis was tested using a one-way ANOVA, which provided F-statistics that measured differences in mean WTP across groups (Mendenhall, Wackerly, and Scheaffer). A significant F-statistic implies the rejection of the H_0, which suggests the presence of significant differences in the mean values across treatments. We performed an F-test for day and extended visitors separately. To test the differences in mean WTP between day visitors and extended visitors, we used paired t-tests in which $A_{DV}A_{EV}$, $B_{DV}B_{EV}$, and $C_{DV}C_{EV}$

Table 4. Mean Differences in Recreation Visitors' WTP (in U.S. Dollars) Across Three Alternative Treatments

Alternative	Mean	95% Confidence Interval of Mean	F-Statistic
Day visitors			
Treatment A_{DV}	4.88 (139)	4.1098–5.6547	23.289*
Treatment B_{DV}	8.75 (139)	7.4974–10.0026	—
Treatment C_{DV}	11.72 (135)	9.7589–13.6745	—
Extended visitors			
Treatment A_{EV}	9.33 (265)	7.3827–11.2758	9.644*
Treatment B_{EV}	12.95 (261)	10.7110–15.1799	—
Treatment C_{EV}	17.45 (250)	14.0559–20.8526	—

Note: Numbers in parentheses are sample sizes.
* Indicates F-statistic significant at 0.01 or better.

were tested in pairs. A significant t statistic means that there are significant differences in mean WTPs between the two groups.

For day visitors, the results revealed that mean WTPs for A_{DV}, B_{DV}, and C_{DV} are \$4.88, \$8.75, and \$11.72, respectively. The 95% confidence interval of the WTP for the three treatments ranges from \$4.11 to \$13.67 (Table 4). This suggests that there is an increase in WTP of the day visitors as the facilities in the recreation site are improved. Results from ANOVA showed that visitors' WTP across treatments are significantly different, as suggested by an F statistic of 23.29 (Table 4).

Results for extended visitors showed that the mean WTP for A_{EV}, B_{EV}, and C_{EV} are \$9.33, \$12.95, and \$17.45, respectively. The 95% confidence interval of the WTP for the three treatments ranges from \$7.38 to \$20.85. This also suggests that the mean WTP of extended visitors increases as on-site facilities are improved. The difference is significant at $p \leq .01$ (Table 4). From our analysis of mean WTP of both day and extended visitors, it is quite conclusive that water-based recreation visitors are willing to pay extra dollars for recreation opportunities with improved facilities.

We also hypothesized that mean WTP between day and extended visitors would be different, because their preferences and motives may potentially be different. In paired t tests, the null hypothesis of no difference between mean WTP values of the treatments was overwhelmingly rejected, implying that there are significant differences between mean WTP values of the two groups across treatments (Table 5). This result indicates that, on average, day and extended visitors have different WTPs for recreation opportunities with each level of water-based recreation facilities in the ONF and that extended visitors have a significantly higher WTP than day visitors.

The difference in mean WTP between day and extended visitors is clearly reflected in the 95% confidence interval plot. Figure 1 shows distinct confidence intervals for each pair of treatments, $A_{DV}A_{EV}$, $B_{DV}B_{EV}$, and $C_{DV}C_{EV}$.

The values analyzed herein are based on visitors' expressions of WTP per trip, not taking into account the extent of their on-site time and resources used in the trip. It is likely that the higher WTP of extended visitors is also associated with the increased time spent on site and additional resources used. If that is the case, their higher WTP would reflect the value of both time spent and resources used—i.e., an absence of embedding or scope effects,

Table 5. Mean Differences in Recreation Visitors' WTP Between Day Visitors and Extended Visitors Across Three Alternative Treatments

Alternative	t-statistic
Treatment A_{DV} vs A_{EV}	−4.1836*
Treatment B_{DV} vs B_{EV}	−3.2282*
Treatment C_{DV} vs C_{EV}	−2.8843*

* Indicates t-statistic significant at 0.01 or better.

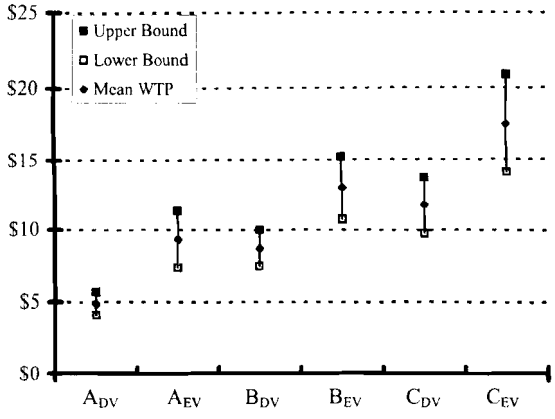

Figure 1. Confidence Intervals for Water-Based Recreation WTP

which answers one of the major criticisms of CVM methodology (Mitchell and Carson). Although on-site time spent and resources used are not separable in this study, it is worth noting that recreation facility improvements that provide such opportunities are valued more. Overall, it is obvious that the visitors to the ONF have a higher WTP for water-based recreation opportunities with improved facilities.

Visitors' total welfare due to the developed recreation facilities in the ONF was measured in terms of their total WTP (consumer surplus). The ONF received about 212,000 day visitors (including campers) and 564 applications from extended visitors for the Sweetwater Springs cabin in 1998. Thus, their total WTP ranges between $875,500 and $1,204,200 per year for basic facilities described in treatment A (Table 6). Their average annual WTP for the basic facilities is about $1,039,800. The total WTP for treatment B ranges from $1,596,000 to $2,128,600, with an average amount of $1,862,300, and the WTP for treatment C ranges from $2,077,000 to $2,909,800, with an average amount of $2,494,500.

Summary and Conclusions

With the growing demand for water-based recreation, the ONF in Florida receives visitors with a wide range of interests and preferences. We found that extended visitors have relatively higher preferences for on-site facilities improvement. These visitors have a considerably higher WTP for recreation opportunities with more facilities. On the other hand, day visitors' WTP is lower, but they would still pay significantly more for improvements in recreation facilities. This result is strongly supported by our regression analysis and statistical tests of visitors' WTP.

Extended visitors' mean WTPs range from $9.33 for recreation with existing facilities, $12.95 for moderate improvements, to $17.45 for more improvements. Similar analyses for day visitors indicated that their mean WTPs range from $4.88 for existing facilities, $8.75 for moderate improvements, to $11.72 for more improvements. It is, therefore, conclusive that the typical visitors in ONF prefer to have on-site facilities improved for water-based recreation opportunities. Our point estimates and statistical analyses overwhelmingly suggest that the differences are significant across all three alternatives.

Table 6. Total Willing to Pay for Water-Based Recreation in the Ocala National Forest (in U.S. Dollars)

Alternative	Mean	Lower Bound	Upper Bound
Day visitors			
Treatment A_{DV}	1,034,500	871,300	1,197,800
Treatment B_{DV}	1,855,000	1,590,000	2,120,000
Treatment C_{DV}	2,484,600	2,069,100	2,898,000
Extended visitors			
Treatment A_{EV}	5,300	4,200	6,400
Treatment B_{EV}	7,300	6,000	8,600
Treatment C_{EV}	9,900	7,900	11,800

From our analysis, ONF visitors' WTP in terms of their consumer surplus is approximately U.S.$1 million per year for basic facilities described in treatment A. The visitors' WTP with moderately improved facilities (treatment B) increases to 1.9 million dollars, and with more improved facilities (treatment C), the amount increases to 2.5 million dollars. Although there is no complete information about the costs of establishment and management of proposed recreation facilities, our results indicate that revenue generated from the visitors would cover a substantial portion of the expenditure. However, further research must be conducted to identify acceptable methods of revenue generation. For example, incrementally raising entrance fees over several years or requiring user fees for different opportunities in a recreation area (e.g., specific fees for swimming, camping, etc.), might prove to be more acceptable to users than a one-time entrance fee. There is even greater potential of extracting some of the WTP values of extended visitors by providing them with much-needed improvements in recreation facilities. Furthermore, results also indicate that people traveling to the forest to enjoy the natural scenery and learn about nature have higher WTP values, even though more facilities may not directly contribute to their objectives. For example, people might pay for naturalists to interpret the natural surroundings when they visit the forest. Also, sites that include supportive development such as interpretive trails, kiosks, or brochures, might have higher values to such visitors. Therefore, this research also indicates that the USDA FS should look for broader opportunities of developing recreation sites to generate revenue.

Altogether, it is evident that our water-based recreation valuation results provide important insights on visitor preferences and values for facility improvements in water-based recreation sites. These results should help the USDA FS explore and design more target-specific facilities for water-based recreation on the ONF and elsewhere.

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