

Are all-terrain vehicle riders willing to pay trail user fees to ride on public lands in the USA?

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Some public lands in the USA offer opportunities for all-terrain vehicle (ATV) riding, but few charge trail use fees. In a case study in the US state of Wisconsin, the contingent valuation method was used to examine riders' willingness to pay (WTP) to ride on public lands. Information on riders' habits, preferences and responses to a dichotomous choice WTP question were collected via a mail survey. ATV club membership, year-round riding habits and preferences for riding on maintained trails and public land influenced WTP positively. Fee amount, advanced skill level, use of the ATV as a hunting support vehicle and living close to an existing trail had a negative impact on WTP.

Keywords: off-highway vehicle; willingness to pay; recreation user fees; motorized recreation; contingent valuation; logit model

All-terrain vehicle (ATV) riding has grown significantly in the USA since the 1970s and is expected to continue to increase over the coming decade (Cordell, 1999).¹ Cordell *et al* (2005) estimated that the number of ATVs in the USA increased by 43% between 1998 and 2001, from 3.9 to 5.6 million vehicles. Further, annual sales of ATVs almost tripled between 1995 and 2003, increasing from 277,800 to 799,400. The state of Wisconsin, which supports

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more than 8,900 km of state-funded ATV trails and is a popular tourism destination for ATV riders, reported significant increases in the number of registered ATV riders from 25,600 in 1986 to nearly 250,000 in 2006 (Wisconsin Department of Tourism Research, 2004; Wisconsin DNR, 2007). As one consequence of this rapid growth in ridership, recreational ATV riders increasingly are challenged to find suitable and legal places to ride. Additionally, public land managers are concerned about the ability to accommodate this increase in ATVs while mitigating the potential adverse effects that can occur from unmanaged ATV use, as well as conflict with and displacement of other recreational groups (Cordell, 2004). Further, for states like Minnesota and Wisconsin, which are experiencing high rates of sale, transfer and parcelization of private forest lands (Kilgore and MacKay, 2007), pressures on public lands for ATV riding opportunities may become particularly great.

Many state and national forests in the USA provide ATV riding opportunities, although trail distance, quality and amenities vary widely. Faced with limited budgets and competing demands from other groups of trail users, public land managers increasingly are challenged to find funds to support ATV trail development, maintenance and enforcement. One funding option for land managers to consider is to charge ATV trail use fees, which are authorized on federal lands in the USA by the Federal Lands Recreation Enhancement Act (PL 108-447) of 2004. Under this fee programme, the funds are used exclusively to maintain the trails and facilities at the site they are collected, supplementing appropriated funds, which may help improve the ability of public lands to meet the needs of this recreation segment. To date, however, the majority of public forests in the USA with ATV trails do not charge a trail use fee. In Midwestern USA, only two national forests currently charge an ATV trail use fee. The Wayne National Forest in Ohio charges ATV riders US\$5 for a daily permit or US\$25 for an annual vehicle use pass, while the Mark Twain National Forest in Missouri charges riders US\$5 per day or US\$35 per year to ride on trails in the forest. Given the increasing demands for ATV riding opportunities and limited public funds to develop and maintain ATV trails, we were interested in finding out whether riders would be willing to pay for the opportunity to ride on public lands if those funds were used solely for the development and maintenance of those trails and access points where the fees were collected.

Little research has been done to examine ATV or, more broadly, off-highway vehicle (OHV) riders' attitudes towards trail use fee structures on public lands or willingness to pay (WTP) such fees. Holmes and Englin (2005) estimated the demand for and value of OHV recreation at three national forest sites in North Carolina. Respondents were queried about their views on OHV recreation use fees and their history of volunteer trail maintenance activities. Results of this analysis suggested that OHV riders were not in favour of user fees as a mechanism to fund public OHV recreation areas. Respondents expressed support of the use of volunteer efforts for trail maintenance activities on public lands. To date, we are aware of only one study that analyses OHV riders' WTP an annual recreation use fee on public lands. In that study, Flood (2005) used a payment card method to query OHV riders about a daily vehicle use fee (US\$0–US\$20), a yearly vehicle use fee (US\$0–US\$75) and an annual licence fee (US\$0–US\$75) to use an OHV area if the fees went back into

maintenance and management of the area. The majority of the survey respondents were not interested in paying for an annual licence fee. Respondents did express some interest in either a daily or annual vehicle use fee, although no analyses were done with the data to predict WTP at different fee levels. Only the percentages of survey recipients responding in the affirmative to each fee level were reported.

The goal of our study was to query ATV riders about their WTP an annual trail use fee and to analyse the data using a logit model so that a WTP equation could be recovered and the influence of individual variables on the likelihood of acceptance of the payment programme could be estimated. To our knowledge, this is the first study of its kind. We report on an empirical case study for registered ATV riders in the state of Wisconsin, identifying median WTP, as well as factors that influence a rider's WTP.

Methods

Survey methods

In the autumn of 2006, a mail survey was distributed to 1,000 people who registered an ATV for public land use in the state of Wisconsin (Smail, 2007). The sample population was drawn randomly from a mailing list purchased from the Wisconsin Department of Natural Resources. Wisconsin has separate registrations for ATVs used solely on private or agricultural land versus those which are allowed on public land and trails. The former registration is US\$15 for the life of the ATV (or until it is sold), while the latter costs US\$35 every two years. This study was limited to those who purchased the public land vehicle registration in 2005 or 2006.

The survey was administered between October and November 2006 following the method described by Dillman (1991) and 519 surveys were completed successfully and returned, with a final usable response rate of 57%. Information was collected on rider habits, preferences, recreational motivations, environmental value orientations and demographics, as well as their WTP an annual vehicle trail use fee to ride on public lands.

Following the recommendations of the 1993 Report of the NOAA Panel on Contingent Valuation (Arrow *et al.*, 1993), the WTP question was posed as a closed format, discrete choice question. The NOAA panel recommended the use of a 'referendum-style,' closed format question because it mimicked the way individuals made decisions in an actual market situation; for example, would I pay this dollar amount for this good or not? This approach is generally preferred over one in which respondents are asked to specify the dollar amount themselves they would be willing to pay because respondents may have little familiarity with the good they are being asked to value and may not be able to specify a reasonable value for the good. We further chose to cast our WTP problem as a single question, discrete choice format rather than use a double-bounded question format due to suggestions by Carson and Groves (2007) that double-bounded, dichotomous choice questions can confuse survey respondents and lead to inconsistent responses to the two valuation questions.² The NOAA Panel further recommended that contingent valuation questions include a

'would not vote' or 'unsure' option in addition to the 'yes' and 'no' choices. The rationale was to provide an option for respondents who were indifferent between a 'yes' and a 'no' response, unable to make a decision without more time or more information, or who preferred another mechanism for making their decision (Arrow *et al*, 1993). The question presented to the survey recipients was:

'Would you be willing to pay US\$X per vehicle per year to ride your ATV on public lands if the funds were utilized for maintenance, management and improvements of the ATV trails and facilities at the site where they were collected?'

Survey participants were assigned randomly one of four fee amounts (US\$25, US\$30, US\$40 or US\$50). One-quarter of the participants were offered each amount. Respondents could answer 'yes,' 'no' or 'unsure'. The smallest fee amount offered was set to US\$25 per vehicle per year, as this was the annual amount that the Wayne National Forest in Ohio charged OHV riders and the Hoosier National Forest in Indiana charged bikers and horseback riders to use dedicated trails. Given that very few ATV user fee programmes were in place on public lands, we had little empirical guidance as what to offer as the highest fee, although US\$35 was the highest annual ATV use fee currently charged on a national forest, as far as we were aware (Mark Twain NF).

Tests for non-response bias in the survey results were conducted comparing demographic data drawn from the ATV registrations, as well as spatial information gathered from GIS address encoding of the respondent's home address. Respondents were compared to non-respondents across several attributes. These tests revealed only one significant difference; respondents were slightly older (3.46 years) than non-respondents. Addresses of the sample population were also coded to a latitude/longitude coordinate using the geo-coding process in ArcMap 13.0 and subsequently assigned to the census block containing their address coordinate. Additionally, the distance of each registrant address from the nearest county, state or federally designated ATV trail in Wisconsin was calculated. No statistically significant differences were found between respondents and non-respondents on any of the spatial criterion.

Estimation methods

We used the discrete choice contingent valuation method (Bishop and Heberlein, 1979) to estimate the value or utility that registered ATV riders ascribed to the opportunity to ride on dedicated, supported trails on public lands. We followed McFadden (1981) in using a random utility model (RUM) to estimate WTP derived from the responses to the discrete choice question. Haener and Adamowicz (1998) note that the RUM is the most commonly used approach to model referendum-style contingent valuation data. According to the principle of utility maximization, a survey respondent would accept the user fee posed to them in the valuation question if the utility associated with the fee programme exceeded their utility without the fee programme. Responses to the contingent valuation question were modelled using a logit model to estimate the probability of participation in the user fee programme, influence of explanatory

variables on participation and the median WTP for the programme.³ Peng *et al* (1996) provide a thorough discussion of the logit model and logistic regression technique.

If A denotes the acceptance of the user fee programme, then the general form of the discrete choice logit model is as follows:

$$\text{Prob}(A) = \frac{e^{\alpha + \beta x}}{1 + e^{\alpha + \beta x}} = \frac{1}{1 + e^{-[\alpha + \beta x]}} \quad (1)$$

where α is the intercept, β is a vector of regression coefficients and x is a vector of predictor variables.

We estimated Equation (1) and then converted this logit equation to a WTP equation by dividing the constant term and each coefficient (other than the coefficient on the user fee variable) by the absolute value of the user fee coefficient, following Cameron (1988). Median WTP was then estimated using this new equation by multiplying these transformed coefficients by the mean of each variable, following Hanemann (1984).

Neither the NOAA panel nor subsequent literature provides clear direction as to how best to handle 'unsure' or 'would not vote' options in discrete choice WTP estimations. Common approaches have been to drop the 'unsure' responses from estimation analyses altogether (Kniivilä, 2006), reassign all of the 'unsure' responses to either the 'yes' or 'no' response category (Carson *et al*, 1998), split the 'unsure' responses between the 'yes' and 'no' response category based on either follow-up questions to the contingent valuation question (Haener and Adamowicz, 1998) or inferences about the 'unsure' respondents (Caudill and Groothuis, 2005), or to include the 'unsure' responses in value estimations directly using maximum likelihood procedures (Wang, 1997). Champ *et al* (2005) and Caudill and Groothuis (2005) provide comprehensive reviews of the literature and techniques for handling an 'unsure' response category. The results of these studies suggest that the choice of how to handle the 'unsure' response category is an empirical one that must be made on a case-by-case basis.

We employed a multinomial logit model and a likelihood ratio test (Cramer and Ridder, 1991), as suggested by Caudill and Groothuis (2005), to determine empirically whether our 'unsure' responses could all be reassigned to either the 'yes' or 'no' response category. Following the Cramer and Ridder (1991) pooling method, a null hypothesis was tested that the coefficients on all of the variables hypothesized to affect 'no' and 'unsure' (or 'yes' and 'unsure') responses were the same. If the results of the pooling test indicate the coefficients are similar, then this suggests that separate response categories for 'no' and 'unsure' (or 'yes' and 'unsure') are not needed and can be combined. To test whether we could reassign or pool all of the 'unsure' responses with either the 'yes' or 'no' responses, we ran a binary logit model with 'yes' and 'no' response categories (where the 'unsures' had all been recoded to either 'yes' or 'no') and compared the regression coefficients to those of a multinomial logit model with all three response categories. We did separate tests to determine whether pooling or reassignment of all 'unsures' to either 'yes' or 'no' responses was supported.

Results of the two pooling tests suggested that the 'unsures' potentially could be recoded as either all 'yes' or all 'no'. The value of the likelihood ratio test statistic, when testing whether 'unsure' responses can be reassigned as 'no'

responses, is 17.92 with 10 degrees of freedom (DOF). The critical value of the chi-squared statistic at the 95% confidence level for 10 DOF is 18.31. Given that our test statistic is smaller than this critical value, we cannot reject the null hypothesis and conclude that, possibly, we could reassign all of the 'unsure' responses to 'no' responses. However, when testing whether the 'unsure' responses could be reassigned to the 'yes' response category, we also could not reject the null hypothesis. The value of this test statistic is 10.51, again smaller than the chi-squared critical value of 18.31 at the 95% confidence level and 15 DOF.

In reality, *some* of the 'unsure' respondents likely could be reassigned as 'yes' responses and some as 'no'. However, additional information would have had to be requested in the survey to have allowed us to make these case-by-case reassignments. Given the contradictory results of the two pooling tests, the approach we took was to estimate three binary logit models as a means to bound the 'true' WTP value. In the first model, the 'unsure' responses were dropped. In the second, all 'unsures' were recoded to 'yes', while in the third, all were recoded to 'no' responses. To clarify, this approach does not contradict directly the results of our pooling test because we are not asserting that all of the 'unsures' should be reassigned to either 'yes' or 'no'. We formulate these three models simply as a means to generate a generous bound around which the true WTP exists.

Results

Survey results

Table 1 is a summary of the descriptive statistics of the survey responses to the WTP question. Respondents expressed considerable and almost identical interest in paying the user fee at both the US\$25 and US\$30 level, with 51% and 52% responding in the affirmative, respectively. WTP started to decline at the US\$40 level, although 43% still responded affirmatively to the fee question. Even at the US\$50 level, one-third of the survey respondents reported a WTP the user fee. The survey results also indicated that a significant portion of respondents were unsure about paying the fee. Averaged across the four fee levels, the percentage of respondents answering 'unsure' (28%) was almost the same as the percentage of respondents answering 'no' (27%) to the payment question. Response percentages of 20–30% in the 'unsure' category are not uncommon among contingent valuation studies which include an 'unsure', 'don't know' or 'won't vote' response category (for example, Wang, 1997; Champ *et al.*, 2005).

Model results

Ten explanatory variables were tested in the model. Table 2 contains descriptions and means of the variables. First, variables were included to test the influence of riding habits and preferences. We hypothesized that those respondents who rode their vehicle year-round (ALLYEAR), preferred riding on maintained trails rather than overland or right-of-way riding (TRAIL) and did at least 50% of their riding on public lands (PUBLIC) would be more willing

Table 1. Responses to the user fee survey question.

Response	Fee amount				Total
	US\$25	US\$30	US\$40	US\$50	
Yes	63 (51%)	66 (52%)	50 (43%)	45 (33%)	224 (45%)
No	27 (22%)	26 (20%)	27 (24%)	55 (41%)	135 (27%)
Unsure	33 (27%)	34 (27%)	38 (33%)	35 (26%)	140 (28%)
<i>Total</i>	<i>123</i>	<i>126</i>	<i>115</i>	<i>135</i>	<i>499</i>

Table 2. Description and means of explanatory variables.

Variable name	Variable definition	Mean with unsure responses	Mean without unsure responses
FEE	User fee amount posed in the referendum question (US\$25, US\$30, US\$40 or US\$50).	36.46	36.43
SAFETY	Binary variable = 1 if the respondent has completed a WI DNR Safety Certification Course.	0.20	0.20
ATVCLUB	Binary variable = 1 if the respondent belongs to an ATV club or association.	0.09	0.09
VOLUNTEER	Binary variable = 1 if the respondent has volunteered to do ATV trail maintenance.	0.10	0.10
ADVANCED	Binary variable = 1 if the respondent classifies their ATV riding skills as advanced.	0.54	0.55
ALLYEAR	Binary variable = 1 if the respondent is a year-round ATV rider.	0.30	0.29
HUNT&FISH	Binary variable = 1 if the respondent's primary use of their ATV is in support of hunting or fishing activities.	0.22	0.23
TRAIL	Binary variable = 1 if the respondent prefers riding on maintained ATV trails.	0.29	0.29
PUBLIC	Binary variable = 1 if at least 50% of the respondent's ATV riding is done on public lands.	0.47	0.49
CLOSE	Binary variable = 1 if the respondent lives close to an established ATV trail (≤ 16 km [10 miles]).	0.27	0.27

to pay a trail user fee. We based our inclusion of the three above-mentioned variables on the following hypotheses. First, we thought that year-round riders might be more likely to pay a user fee because they might derive greater use from dedicated trails than those who ride only a portion of the year. We hypothesized that respondents who preferred riding on established ATV trails might be more willing to pay a user fee since this was the riding environment which they preferred and, as such, they might be more likely to use fee trails than riders who did not like the rules and constraints associated with trail

riding. Similarly, we hypothesized that those riders who already rode on public lands, versus private or commercial properties, might be more likely to use fee trails on public lands.

Nelson (1996) found that many OHV riders in Michigan used their vehicles in support of other recreational activities such as hunting, fishing and camping, rather than as a recreational pursuit in and of itself. Thus, we were interested in determining whether riders whose primary use of their vehicle was in support of hunting and fishing were less willing to pay trail user fees (HUNT&FISH).

We were interested also in examining the influence of commitment to the sport through proxies such as rider skill level (ADVANCED), participation in ATV club activities (ATVCLUB, VOLUNTEER) and participation in safety training courses (SAFETY). Schoenecker (2006) found that advanced ATV riders sought different riding experiences than intermediate riders. Given this, we wanted to examine whether the self-identified skill level of the rider had an influence on WTP. Flood (2005) found that riders who belonged to an OHV club expressed greater support for an annual OHV registration fee than riders who did not belong. We also surmised that respondents in our study who belonged to an ATV club might be more willing to pay a user fee. Results of a survey of OHV riders by Holmes and Englin (2005) found that many riders thought that volunteer efforts should be used to maintain motorized trails on public lands rather than user fees. Given this, we hypothesized that those OHV riders in our survey who had volunteered to do trail maintenance might be less willing to pay user fees. Finally, a variable was also included to examine the influence of proximity to existing ATV trails on public lands (CLOSE).⁴

The probability that a rider would accept the user fee posed to them was estimated using the following binary logit equation:

$$\begin{aligned} \text{Probability (Accept Fee Amount)} = & 1/[1 + \exp\{-\beta_0 - \beta_1(\text{FEE}) \\ & + \beta_2(\text{SAFETY}) + \beta_3(\text{ATVCLUB}) - \beta_4(\text{VOLUNTEER}) + \beta_5(\text{ADVANCED}) \\ & + \beta_6(\text{ALLYEAR}) - \beta_7(\text{HUNT\&FISH}) + \beta_8(\text{TRAIL}) + \beta_9(\text{PUBLIC}) \\ & + \beta_{10}(\text{CLOSE})\}]. \end{aligned} \quad (2)$$

Equation (2) was solved using SAS 9.1 and the maximum likelihood estimation method. Table 3 summarizes the results of this estimation. Model I excluded respondents who provided an 'unsure' response to the payment question. In Model II, all 'unsure' responses were recoded to 'no', while in Model III all 'unsures' were recoded to 'yes'. All three logit models are significant at $P \leq 0.002$ based on likelihood ratio statistics of 48, 34 and 39, respectively.

In Model I, eight of the ten explanatory variables were found to have a statistically significant influence on the probability of accepting the user fee amount. At the 1% significance level, the FEE variable was correlated negatively with the probability of acceptance, as would be expected. As the fee amount increases, the probability of a rider accepting it declines. The coefficient for ALLYEAR was positive, indicating that respondents were more willing to accept the fee if they rode year-round, a proxy for the level of interest in the sport and use of their vehicles. The constant was also significant at this significance level.

Table 3. Binary logit modelling results.

Variable	Model I: yes and no only Coefficient	Model II: unsure coded as no Coefficient	Model III: unsure coded as yes Coefficient
Constant	2.1223*** (0.5210)	0.7644** (0.4032)	2.4096*** (0.4708)
FEE	-0.0449*** (0.0123)	-0.0308*** (0.0099)	-0.0362*** (0.0111)
SAFETY	-0.1041 (0.3000)	-0.1454 (0.2435)	-0.1294 (0.2696)
ATVCLUB	1.0429* (0.5857)	0.3989 (0.3627)	1.1986** (0.5681)
VOLUNTEER	0.2924 (0.4552)	0.0855 (0.3465)	0.1916 (0.428)
ADVANCED	-0.6077** (0.2546)	-0.2857 (0.2002)	-0.4513** (0.2273)
ALLYEAR	0.8376*** (0.2872)	0.5002** (0.2176)	0.6499*** (0.2549)
HUNT&FISH	-0.5217* (0.2813)	-0.2781 (0.2352)	-0.5015** (0.2479)
TRAIL	0.4440* (0.2773)	0.2153 (0.2129)	0.2496 (0.2533)
PUBLIC	0.5896** (0.2654)	0.5858*** (0.2104)	0.2951 (0.2382)
CLOSE	-0.6696** (0.2717)	-0.4303** (0.2104)	-0.4438* (0.2404)
N	344 ^a	475 ^a	475 ^a
Wald statistic	38.93***	30.63***	33.29***
% Correct predictions	71	64	68

Notes: Values in parentheses are standard errors. ***Significant at the 1% level; **significant at the 5% level; *significant at the 10% level.

^aThe difference in these *N* values from the survey response *N* is due to missing data elements.

Three variables were significant at the 5% significance level: ADVANCED and CLOSE had negative coefficients, while PUBLIC had a positive influence. It was somewhat surprising that self-identified advanced riders, versus intermediate or beginners, were less willing to pay a user fee. This may suggest that they do not think that public trails provide enough challenge or distance to suit their needs. It was also somewhat surprising that the variable indicating that a rider lived within 10 miles of an established ATV trail on public land (CLOSE) had a negative influence on acceptance of the user fee. Several explanations for this finding are possible. One may be that these riders currently use these trails for free and do not see any advantage or benefit to charging fees to ride at these locations. Or, perhaps they might think that if fees were charged and amenities enhanced, these trails might become more crowded.⁵ Finally, those riders who indicated that currently at least 50% of their riding was on public lands (PUBLIC) were more likely to accept the fee level,

suggesting that there was a desire to continue to ride on public lands, particularly if the trails and facilities were better maintained and enhanced.

At the 10% significance level, the variable indicating membership in an ATV club (ATVCLUB) was positive, as was the variable that described a rider's preference for riding on dedicated trails (TRAIL) versus overland or right-of-way riding. Both of these responses were expected and supported Flood's (2005) finding that members of an OHV club were more interested in paying an annual ATV registration fee than those riders who did not belong to a club. Riders who indicated that their primary use of the ATV was in support of hunting and fishing (HUNT&FISH) were less likely to accept the user fee. This suggests that these riders might not use or value dedicated trails, or that they believe they should not be charged additional fees to pursue hunting and fishing activities.

In Model II, where the 'unsures' were recoded to 'no', the constant and four of the same variables that were significant in Model I were also found to be significant (FEE, ALLYEAR, PUBLIC, CLOSE). Signs on all variables were the same in all three models. As with Model I, the larger fees and closer proximity to existing trails had a negative influence on the probability of acceptance of the fee. Those riders who currently ride year-round and do the majority of their riding on public lands are more likely to accept the fee amount. Finally, Model III shared all of the variables that were significant in Model I, except for TRAIL and PUBLIC. The signs were the same for all of the variables between Models I and III. Neither the SAFETY variable nor the VOLUNTEER variable were significant in any of the three models. Thus, our findings with the VOLUNTEER variable were counter to Holmes and Englin's (2005) work, which found that those who volunteered for ATV trail maintenance activities were less interested in paying trail user fees.⁶

WTP estimates

In order to derive WTP estimates from the logit model, Equation (2) was transformed by dividing the constant term and each coefficient (other than the FEE coefficient) by the absolute value of the FEE coefficient, following Cameron (1988). The WTP equation for Model I was specified as:

$$\begin{aligned}
 &\text{WTP for Access to Maintained ATV Trails on Public Land} \\
 &= (2.1223/0.0449) - (0.1041/0.0449)\text{SAFETY} \\
 &+ (1.0429/0.0449)\text{ATVCLUB} + (0.2924/0.0449)\text{VOLUNTEER} \\
 &- (0.6077/0.0449)\text{ADVANCED} + (0.8376/0.0449)\text{ALLYEAR} \\
 &- (0.5217/0.0449)\text{HUNT\&FISH} + (0.4440/0.0449)\text{TRAIL} \\
 &+ (0.5896/0.0449)\text{PUBLIC} - (0.6696/0.0449)\text{CLOSE}.
 \end{aligned} \tag{3}$$

Similar equations were developed for Models II and III from the coefficients in Table 3. The transformed coefficients in Equation (3) represent the impact

Table 4. Coefficients from the WTP function and median WTP for each model.

Variable	Model I: yes and no only WTP coefficient	Model II: unsure coded as no WTP coefficient	Model III: unsure coded as yes WTP coefficient
Constant	47.27	24.82	66.56
SAFETY	-2.31	-4.72	-3.57
ATVCLUB	23.23	12.95	33.11
VOLUNTEER	6.51	2.78	5.29
ADVANCED	-13.53	-9.28	-12.47
ALLYEAR	18.66	16.24	17.95
HUNT&FISH	-11.62	-9.03	-13.86
TRAIL	9.89	6.99	6.90
PUBLIC	13.13	19.02	8.15
CLOSE	-14.91	-13.97	-12.26
Median WTP	US\$50.11	US\$30.39	US\$67.48

of each of the explanatory variables on WTP the trail use fee. For example, in Model I, riders who belong to an ATV club are willing to pay US\$23.23 more for an annual trail use fee than those riders who do not.

Median WTP was estimated from Equation (3) by multiplying the transformed coefficients by the sample means of each independent variable and summing these with the transformed constant, following Hanemann (1984). Table 4 contains these WTP coefficients and median WTP for each model. Median WTP ranged from US\$30 for Model II, where the 'unsures' were recoded to 'no', to US\$67 in Model III, where the 'unsures' were recoded to 'yes'. The median for Model I when 'unsure' responses were excluded was approximately US\$50. Authors who have conducted similar studies with 'unsure' responses also have reported large differences in median WTP based on the manner in which 'unsure' responses are reassigned (for example, Haener and Adamowicz, 1998; Caudill and Groothuis, 2005; Champ *et al.*, 2005).^{7,8}

Discussion

The purpose of this study was to determine if registered ATV riders in Wisconsin were willing to pay a trail user fee for the opportunity to ride on dedicated, funded ATV trails on public land. We used the discrete choice contingent valuation method to estimate the influence of a set of explanatory variables that either measured directly or were proxies for ATV rider preferences and habits, commitment to the sport and proximity of the rider's primary home to existing ATV trails on public land. Our median WTP estimates ranged from US\$30 to US\$67, higher than the annual use fee currently being charged to recreational trail users in two national forests in Midwestern USA.

The results of our study indicate that registered ATV riders in Wisconsin who belong to an ATV club, ride year-round and prefer riding on established

trails and public lands are more likely to be willing to pay a trail use fee. Conversely, advanced riders, riders who live within 16 km of an established ATV trail on public land and those who ride their machines primarily as support vehicles while hunting and fishing are less likely to pay. Taken together, the set of significant variables suggests that there are certainly differences between those who are willing to pay and those who are not. In general, those riders who already use trails on public lands are more supportive of a fee to ride on them than riders who prefer to ride in other venues and for other pursuits. This suggests that the development of fee-based access for new ATV trails on public lands might not attract riders who do not already enjoy riding public trails.

The results of our modelling analysis could provide guidance to public land managers considering the development of a trail fee system and new ATV trails on public land. First, since year-round riders were more likely to be interested in paying a recreation user fee than those in our study who rode only a portion of the year, land managers should consider whether trails and facilities designed under such a programme could provide opportunities and access for ATV riders throughout the year.

Given that advanced skill level had a negative effect on WTP, this may suggest that as ATV riders increase their skill level, the controlled and regulated trail riding experiences currently facilitated by public lands may lose their appeal. If this is the case, additional designation or creation of ATV trails on public land may not provide increased opportunities for all riders, they simply may provide more options for those already willing to pay and/or for those riders with beginner to intermediate skill levels. In order to attract and satisfy advanced-level riders, managers may need to consider the feasibility of creating 'advanced' trails that may be longer and/or present greater technical challenges than typical trails which exist currently on public lands. In their work with ATV riders in Minnesota, Schneider and Schoenecker (2005) determined that desired trail characteristics and ride experiences varied with rider skill level. Their findings, in combination with ours, suggest that a 'one size fits all' approach to ATV trail development is unlikely to provide the full spectrum of experiences riders seek (Schoenecker, 2006).

Since our model indicates that riders who live close to existing ATV trails on public lands are less willing to pay user fees, the converse of this may be that people who live farther away from dedicated trails may be more interested in travelling to these areas to access these riding opportunities. This might be explained, in part, by the fact that ATV user fees likely would represent a proportionally smaller share of overall trip costs for those living farther away from ATV trails than they do for those living close by.

Conclusions

Given the limited budgets of public land managers for development and maintenance of ATV trails and associated amenities on public lands, the collection of recreation trail use fees may offer one means to meet better the needs of this growing recreation and tourism segment in the country. However, this study indicates that support for trail use fees is not universal among all

riders, particularly among those who do not ride public land trails already or who ride their ATVs primarily as support vehicles. In order for any user fee programme to be successful, public land managers would need to ensure that ATV trails and facilities are designed and maintained to balance competing recreational needs, environmental considerations and ATV rider preferences and skill levels. It should be noted that Wisconsin is known as a particularly high quality region for ATV riding (Wisconsin Department of Tourism Research, 2004; Wisconsin DNR, 2007). Given this, caution should be used in extrapolating the WTP estimates to other areas. Additional research should be performed to determine if there are regional differences in WTP for such a user fee programme.

Endnotes

1. The Specialty Vehicle Institute of America defines an all-terrain vehicle as a four-wheeled motorized vehicle designed for a single rider for use in work and recreational purposes. Off-highway vehicles (OHVs) are a broader class of motorized recreational vehicle intended for use off roads and include ATVs, along with off-road motorcycles, dune buggies and snowmobiles.
2. Although the contingent valuation approach has been used widely over the past two decades, debate remains in the literature as to the validity and reliability of valuation estimates derived from this method (for example, Carson *et al.*, 2001; Little and Berrens, 2004). Of concern is whether estimates derived from this technique suffer from hypothetical bias and, as a consequence, fail to capture accurately a respondent's WTP for a non-market good or service. Carson *et al.* (2001) provide a thorough review of the debate surrounding the contingent valuation approach and they conclude that many of the potential problems with the technique (for example, strategic bias, information bias, starting bid bias, non-response bias) can be avoided by careful study design and implementation. Further, Little and Berrens (2004) suggest that hypothetical bias can be reduced through the use of a referendum-style WTP question.
3. A logit model can be used if it is assumed that the random error term in the utility function is a random variable independently and identically distributed with a zero mean (Haener and Adamowicz, 1998, p. 220.)
4. To calculate the CLOSE variable and determine whether a respondent was within 10 miles of an existing ATV trail on public land, the location of each respondent's primary residence was mapped in ARCGIS 9.1. Dedicated ATV trails were mapped from a GIS data layer obtained from the Wisconsin DNR and then surrounded by a 10-mile buffer. Respondents whose primary residence fell within any of the 10-mile buffers were assigned a value of 1 for the CLOSE binary variable.
5. An additional possible explanation for a reduced WTP for fees by those who lived near established ATV trails was offered by one of the anonymous reviewers. The reviewer suggested that some people might have chosen to live near public lands to afford themselves easy access to recreation opportunities and, as a consequence, might have paid for this opportunity through higher housing costs, property taxes and/or commuting distances. In this sense, these respondents might feel that they have paid a fee or premium already for access to trails and would be less likely to pay additional fees.
6. A comparison of the three models illustrates that different variables influence the likelihood of accepting the offered bid amount depending on how the 'unsure' responses are treated. This suggests that different factors influence the likelihood of answering 'yes', 'no' or 'unsure' and that the 'unsure' responses cannot be dropped or simply reassigned without introducing bias. This is underscored further by examining the means of the explanatory variables with and without the 'unsure' responses in Table 2. Although the means are very similar between the two groups, they are not identical. This suggests that the characteristics of the unsure respondents are slightly different than the 'yes' and 'no' respondents and thus removing or summarily reassigning the 'unsures' results in a sample with slightly different characteristics for each model. More sophisticated treatments of the 'unsure' responses would have been possible if 'follow-up' questions (for example, Welsh and Poe, 1998; Champ and Bishop, 2001) had been posed to the survey respondents to gather more information about their degree of certainty in their response.

- to the WTP question. Since our survey does not include such additional questions, we acknowledge that our treatment of the 'unsure' responses is an approximate means of identifying a WTP function when an 'unsure' response category is included.
7. The range in the median WTP values from the three models illustrates the point that WTP estimates can be changed substantially by the exclusion and/or reassignment of 'unsure' responses. In reality, the true WTP likely lies somewhere in the middle of the range of values. Our method of solving the three models represents an approximate means for addressing 'unsure' responses to the WTP question and a broad bound within which the true WTP exists. We would strongly advise the inclusion of 'follow-up' questions (for example, Welsh and Poe, 1998; Champ and Bishop, 2001) for researchers developing WTP studies with an 'unsure' response category. Doing so would allow for a more precise reassignment of 'unsure' responses and a tighter estimate of the median WTP.
 8. While confidence intervals around WTP estimates from logit models can be calculated, it is not straightforward due to the fact that WTP is a non-linear function of the maximum likelihood estimates of the logit model. At best, complex simulation methods have been developed to approximate the distribution of WTP estimates. Krinsky and Robb (1986) and Park *et al* (1991) discuss such simulation methods.

References

- Arrow, K., Solow, R., Portney, P., Leamer, E., Radner, R., and Schuman, H. (1993), 'Report of the NOAA panel on contingent valuation', US Department of Commerce, *Federal Register* 58, pp 4202–4614.
- Bishop, R.C., and Heberlein, T.A. (1979), 'Measuring values of extramarket goods: are indirect measures biased?', *American Journal of Agricultural Economics*, Vol 61, pp 926–930.
- Cameron, T.A. (1988), 'A new paradigm for valuing non-market goods using referendum data: maximum likelihood estimation by censored logistic regression', *Journal of Environmental Economics and Management*, Vol 15, pp 355–379.
- Carson, R.T., and Groves, T. (2007), 'Incentive and informational properties of preference questions', *Environmental Resource Economics*, Vol 37, pp 181–210.
- Carson, R.T., Hanemann, W.M., Kopp, R.J., Krosnick, J.A., Mitchell, R.C., Presser, S., Ruud, P.A., Smith, V.K., Conaway, M., and Martin, K. (1998), 'Referendum design and contingent valuation: the NOAA panel's no-vote recommendation', *Review of Economics and Statistics*, Vol 80, No 3, pp 484–487.
- Carson, R.T., Flores, N.E., and Meade, N.F. (2001), 'Contingent valuation controversies and evidence', *Environmental and Resource Economics*, Vol 19, pp 173–210.
- Caudill, S.B., and Groothuis, P.A. (2005), 'Modeling hidden alternatives in random utility models: an application to "don't know" responses in contingent valuation', *Land Economics*, Vol 81, No 3, pp 445–454.
- Champ, P.A., and Bishop, R.C. (2001), 'Donation payment mechanisms and contingent valuation: an empirical study of hypothetical bias', *Environmental and Resource Economics*, Vol 19, No 4, pp 383–402.
- Champ, P.A., Alberini, A., and Correias, I. (2005), 'Using contingent valuation to value a noxious weeds control program: the effects of including an unsure response category', *Ecological Economics*, Vol 55, pp 47–60.
- Cordell, H.K., ed (1999), *Outdoor Recreation in American Life: A National Assessment of Demand and Supply Trends*, Sagamore Publishing, Champaign, IL.
- Cordell, H.K. (2004), *Outdoor Recreation for 21st Century America: A Report to the Nation, the National Survey on Recreation and the Environment*, Venture Publishing, State College, PA.
- Cordell, H.K., Betz, C.J., Green, G., and Owens, M. (2005), *Off-Highway Vehicle Recreation in the United States, Regions and States: A National Report from the National Survey on Recreation and Environment (NSRE)*, US Forest Service, Washington, DC.
- Cramer, J.S., and Ridder, G. (1991), 'Pooling states in the multinomial logit model', *Journal of Econometrics*, Vol 47, pp 267–272.
- Dillman, D.A. (1991), 'The design and administration of mail surveys', *Annual Review of Sociology*, Vol 17, pp 225–249.
- Flood, J.P. (2005), 'Just don't tell me no: managing OHV recreational use on National Forests', in Peden, J.G., and Schuster, R.M., eds, *Proceedings of the 2005 Northeastern Recreation Research*

- Symposium: April 10–12 2005; Bolton Landing, NY*, General Technical Report NE-341, US Forest Service, Northeastern Research Station, Newtown Square, PA.
- Haener, M.K., and Adamowicz, W. (1998), 'Analysis of don't know responses to the referendum contingent valuation questions', *Agricultural and Resource Economics Review*, Vol 27, No 2, pp 218–230.
- Hanemann, W.M. (1984), 'Welfare evaluations in contingent valuation experiments with discrete response', *American Journal of Agricultural Economics*, Vol 66, pp 332–341.
- Holmes, T.P., and Englin, J.E. (2005), 'User fees and the demand for OHV recreation', in Shultz, S.D., ed, *Benefits and Costs of Resource Policies Affecting Public and Private Land*, Western Regional Research Publication, W-1133, Salt Lake City, UT.
- Kilgore, M.A., and MacKay, D.G. (2007), 'Trends in Minnesota's forest land real estate market: implications for forest management', *Northern Journal of Applied Forestry*, Vol 24, No 1, pp 37–42.
- Kniivilä, M. (2006), 'Users and non-users of conservation areas: are there differences in WTP, motives and the validity of responses in CVM surveys?', *Ecological Economics*, Vol 59, pp 530–539.
- Krinsky, I., and Robb, A.L. (1986), 'On approximating the statistical properties of elasticities', *Review of Economics and Statistics*, Vol 68, pp 715–719.
- Little, J., and Berrens, R. (2004), 'Explaining disparities between actual and hypothetical stated values: further investigation using meta-analysis', *Economics Bulletin*, Vol 3, No 6, pp 1–13.
- McFadden, D. (1981), 'Economic models of probabilistic choice', in Manski, C., and McFadden, D., eds, *Structural Analysis of Discrete Data with Econometric Application*, MIT Press, Cambridge, MA.
- Nelson, C.M. (1996), 'Registered Michigan off-road vehicle use and users: forest policy implications', *Northern Journal of Applied Forestry*, Vol 13, No 2, pp 84–88.
- Park, T., Loomis, J.B., and Creel, M. (1991), 'Confidence intervals for evaluating benefits estimates from dichotomous choice contingent valuation studies', *Land Economics*, Vol 67, No 1, pp 64–73.
- Peng, C.-Y.J., Lee, K.L., and Ingersoll, G.M. (1996), 'An introduction to logistic regression analysis and reporting', *The Journal of Educational Research*, Vol 96, No 1, pp 3–14.
- Schneider, I.E., and Schoenecker, A.H. (2005), *All-terrain Vehicles in Minnesota: Economic Impact and Consumer Profile*, University of Minnesota Tourism Center, St Paul, MN.
- Schoenecker, A.H. (2006), 'Describing and differentiating recreational ATV rider preferences', 14 December 2006, Unpublished Master's of Science Degree in Natural Resource Science and Management, College of Food, Agriculture, and Natural Resource Sciences, University of Minnesota, St Paul, MN.
- Smail, R. (2007), 'Recreational motivations and attitudes toward regulation of Wisconsin all terrain vehicle owners', June 2007, Unpublished Master's Thesis in Human Dimensions of Resource Management, College of Natural Resources, University of Wisconsin – Stevens Point, WI.
- Wang, H. (1997), 'Treatment of "don't know" responses in contingent valuation surveys: a random valuation model', *Journal of Environmental Economics and Management*, Vol 32, No 2, pp 219–232.
- Welsh, M.P., and Poe, G.L. (1998), 'Elicitation effects in contingent valuation: comparisons to a multiple bounded discrete choice approach', *Journal of Environmental Economics and Management*, Vol 36, No 2, pp 170–185.
- Wisconsin Department of Natural Resources (2007), Public and municipal ATV registrations, e-mail communication with licensing department, 12 February 2007.
- Wisconsin Department of Tourism Research (2004), 'Economic and demographic profile of Wisconsin's ATV users: results of an economic survey conducted between June and October 2003', Wisconsin Department of Tourism, Madison, WI.