Attitudes and Intentions of Off-Highway Vehicle Riders toward Trail Use: Implications for Forest Managers

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Management of off-highway vehicles (OHV) in public forest areas requires up-to-date information about the attitudes and intentions of OHV riders toward trail use. A survey of 811 members of the New England Trail Riders Association was conducted in fall 2007; 380 questionnaires were completed and returned. Descriptive statistics and regressions were used to identify relationships between OHV rider attitudes, management preferences, and intentions toward two trail use–related behaviors (i.e., illegal use of trails by OHVs and the creation and/or use of unauthorized trails by OHV riders). Results reveal that the average responding association member has a negative attitude toward the two depreciative behaviors, intends to ride OHVs legally, and slightly prefers indirect over direct forms of management. Significant relationships between intentions and both attitudes and management preferences are identified. Policy and management implications and strategies are discussed.

Keywords: off-highway vehicle, attitudes, intentions, trail use

Between 1999 and 2004, an estimated 39.7 million people (16 years and older) participated in off-highway vehicle (OHV) riding within the United States. In the northern United States (i.e., New England, Mid-Atlantic and Great Lakes states) during the same time period, an estimated 13.4 million people (aged 16 years or older) participated. Nationwide, OHV use increased nearly 42% during this time (Cordell et al. 2005). These numbers are significant for public forests and their managers in states where high population densities, combined with the limited availability of public land for off-road use, magnify issues related to competing recreational uses.

As pressure on public lands increases for motorized activities such as OHV use, additional strategies for providing recreational access for all users, reducing conflicts between different user groups, and maintaining the natural resource base are needed. If forest managers wish to collaborate with OHV clubs and associations to minimize negative impacts associated with OHV use and provide positive OHV riding experiences, information about OHV riders’ attitudes, intended behaviors, and management preferences is required. This study provides information for forest managers and OHV riders about the attitudes, intentions, and management preferences of OHV riders toward two intended behaviors: (1) the use of trails on which OHVs are prohibited and (2) the development and/or use of unauthorized trails (i.e., trails not authorized or created by the land-management agency in charge of the property). Our main objective was to quantify and identify relationships between OHV association member age, riding experience, participation, attitudes, intentions, and management preferences by surveying members of the New England Trail Riders Association (NETRA). To en-
able collaborative efforts between forest managers and the OHV riding community, association members’ perceptions of the two trail use behaviors are clarified and their preferences for indirect and direct management strategies are identified.

**Literature Review**

OHVs are defined as motorized vehicles used on trails or off-highway (i.e., on dirt roads). These vehicles include four-wheel drive jeeps or sport utility vehicles (SUV) used off-highway for recreational purposes, motorcycles designed for off-highway use (i.e., off-highway motorcycles [OHM] or dirt bikes), and all-terrain vehicles (ATV) designed for off-highway use including four- and six-wheelers. Although snowmobiles are considered a type of OHV, they were excluded from this study because of differences in the perceived environmental impacts of snowmobiles when compared with other OHVs.

Prior studies about OHV use in the United States have often used case studies and focused on broad ATV-related issues facing public lands. For example, Karasin (2003) discussed the impacts from ATV use on snowmobile trails, wetlands, and vegetation in New York's Adirondack forest areas. In Vermont, OHV-related issues, including property damage caused by illegal ATV riding, noise impacts on other recreationists, and the lack of legal places to ride for ATV riders, were identified (ATV Collaborative Draft Report for Public Review 2004). A study of Michigan’s OHV users revealed that 75% of Michigan riders depended on OHVs for access to hunting and fishing locations in 1999; some demographic differences (i.e., mean age and household composition) between OHM and ATV riders were also identified (Nelson et al. 2000). These case studies provide insight into potential impacts from OHV use but do not provide resource managers with a detailed understanding of the perspectives of OHV riders.

This study uses the Theory of Planned Behavior, an established model for examining the relationships between beliefs, attitudes, and intended behaviors (Ajzen 1991, Hrubes et al. 2001), as a framework for OHV riders’ attitudes and intentions. The Theory of Planned Behavior suggests that behaviors stem from intentions that are influenced by attitudes and beliefs concerning the behaviors. Ajzen (1991) describes three basic types of beliefs: behavioral (i.e., beliefs about the likely consequences of a certain behavior), normative (i.e., beliefs about the expectations of others concerning a certain behavior), and control (i.e., beliefs about factors that may limit or enable a certain behavior). Behavioral beliefs influence attitudes, defined by Ajzen and Fishbein (1980) as an individual’s positive or negative evaluations of performing a specific behavior. Likewise, normative beliefs influence an individual’s perceptions concerning the social pressure for or against a specific behavior (i.e., subjective norms; Hrubes et al. 2001), and control beliefs influence the individual’s perceptions concerning the ease or difficulty of performing a specific behavior (i.e., perceived behavioral controls; Ajzen and Driver 1992). Attitudes toward the behavior, subjective norms, and perceived behavioral controls influence an individual’s intention to perform that behavior. Intention directly influences performing the actual behavior (Ajzen 1991). Hrubes et al. (2001) identify intended behaviors as the “immediate antecedent[s] of behavior,” and indicate that as long as an individual has control over situational factors, intended behavior can be a strong indicator of whether or not a behavior is performed.

Previous studies have used the Theory of Planned Behavior to enhance our understanding of recreational and environmental behaviors and the elements influencing them. Hrubes et al. (2001) found attitudes, subjective norms, and perceived behavioral controls to be significant determinants of intentions to hunt. Other studies have focused on specific relationships within the theory such as belief–attitude (Bright and Manfredo, 1996) and attitude–intention (Prislin and Ouellette 1996). Although these studies have greatly enhanced our understanding of the Theory of Planned Behavior, studies that apply the theory to OHV use have not been previously conducted. Our study seeks to apply the theory to OHV use by focusing on the attitude–intention relationship for two separate trail use behaviors. Because of limitations in the length of the questionnaire, other relationships within the Theory of Planned Behavior (e.g., subjective norm–intention), although likely to be important in determining OHV rider intentions, were not included.

In addition to studying the attitude–intention relationship, we seek to understand the influence of age, participation in OHV riding (i.e., number of days spent riding an OHV in 2007), experience (i.e., number of years spent riding an OHV), and management preferences on intentions toward the two trail use behaviors. The relationship between Theory of Planned Behavior constructs and leisure involvement was studied by Ajzen and Driver (1992); moderate to strong correlations were found between involvement in five different leisure activities and both attitudes and intentions. Other studies have shown relationships between age, amount of experience with an activity, involvement in an activity, and management communications (e.g., brochures) designed to encourage behavioral changes. For example, researchers have identified changes in participation in leisure activities associated with age (Gordon et al. 1976, Unkel 1981, Iso-Ahola et al. 1994). Positive relationships between childhood recreational experiences and adult recreation participation were identified by Sofranko and Nolan (2009) and McClaskie, Napier, and Christensen (1986). Krump and Brown (1982), and Roggenbuck and Berrier (1982) found that the less prior experience an individual had with an activity, the more open they were to management communications designed to affect their behaviors; similar results were noted by Manfredo and Bright (1991) for the relationship between prior knowledge of a message topic and the influence of the message on beliefs and behaviors concerning the topic.

Additional studies have examined differences between indirect and direct management communications and behaviors. Duncan and Martin (2002) found that use of an interpretive message (i.e., indirect management) was just as effective at influencing intended behaviors as a sanction message (i.e., direct management) in three scenarios and more effective than the sanction message in the fourth; both interpretive and sanction messages were more effective at influencing intended behaviors than no message at all. Vander Stoep and Gramann (1987) noted a 70–88% decrease in deprecative behaviors, depending on the verbal message communicated to the visitor. Gramann et al. (1995) found a combination of indirect and direct management techniques had the greatest influence on intentions to obey rules. Our study examines preferences for indirect and direct management, as well as age, experience, participation, and attitudes, to provide an in-depth understanding of the elements that influence the behavioral intentions of OHV riders.
Methods

To learn more about the attitudes, intentions, and management preferences of OHV riders, we surveyed 811 members of the NETRA in 2007. To obtain a sample of members that was equally distributed across the northeast region, 125 members were randomly selected from each state (i.e., New York, Connecticut, Vermont, New Hampshire, Rhode Island, and Massachusetts); all members were surveyed in Maine and New Jersey because of low membership numbers in those states. The survey consisted of four separate mailings to participants using a modified Tailored Design Method (Dillman 2000). Following completion of the survey, we sent a one-page nonresponse questionnaire to 100 nonrespondents randomly selected from the original sample to check for nonresponse bias. The NETRA Board of Directors oversaw the sample collection and survey mailings to ensure the confidentiality of its members. Although surveying NETRA members enabled the collection of data that would otherwise have been difficult to obtain, it is important to note that our focus on association members provides results that may not be representative of nonassociation OHV riders.

The questionnaire consisted of 112 questions about OHV rider demographics, personal riding experience and participation, riding locations, perceptions of management strategies, attitudes, and intended behaviors. Questions used to elicit management preferences, attitudes, and intended behaviors were modified from prior works (Rogers 1985, Ajzen and Driver 1992, Bright and Manfredo 1996) to reflect the specific characteristics of OHV use and its relationship to natural resource management. Respondents were asked to indicate their agreement or disagreement with statements related to the attitudes and intended behaviors of riders in general using a 5-point scale (e.g., strongly disagree, disagree, neutral, agree, strongly agree); a similar 5-point scale was used for statements related to management preferences (i.e., strongly not favored, neutral, and strongly favored). Respondents were asked to identify the number of years they spent riding an OHV (i.e., experience), as well as the number of days spent riding each type of OHV (i.e., four-wheel drive, ATV, and OHM) in 2007 (i.e., participation). The NETRA Board of Directors and volunteer OHV riders pilot-tested the questionnaire, providing valuable feedback for improvement before implementation.

After data entry, descriptive statistics were used to quantify demographics and participation in OHV riding and trail maintenance efforts. Variables related to the attitudes, intentions, and management preferences of OHV riders concerning the two trail use behaviors were combined into factors based on previous research (Rogers 1985, Ajzen and Driver 1992, Bright and Manfredo 1996). We quantified the attitudes, intentions, and management preferences in SPSS (Statistical Package for the Social Sciences, Version 11.0; SPSS, Inc., Chicago, IL) by averaging the variables comprising each factor for each behavior. A Cronbach's alpha of 0.7 or greater was used to establish the reliability (i.e., internal consistency) of factors (Hair et al. 1998, p. 118). To remove digit preference in responses to the “years spent riding an OHV” (i.e., experience) and “days spent riding in 2007” (i.e., participation) variables, both were converted to categorical variables for the regressions. The categories for years spent riding an OHV were 1–5, 6–10, 11–15, 16–20, 21–25, 26–30, 31–35, 36–40, and 41 or more years; the categories for days spent riding in 2007 were 1–10, 11–20, 21–30, 31–40, 41–50, and 51 or more days. A stepwise regression analysis for each behavior was conducted to identify relationships between intentions (dependent variable) and the independent variables of attitude, direct management preferences, indirect management preferences, age, years riding, and days riding in 2007. Because questions related to intentions were worded in the negative (i.e., I do not intend to . . . ), responses for intentions were reverse coded (i.e., positive responses were coded as negative, and negative responses were coded as positive) for the regression analysis to ensure that all factors were coded in the same direction. Pearson’s correlations were calculated for all independent variables.

Results

Response Rate

Of the 811 questionnaires distributed to the sample of NETRA members, 380 were completed and returned and 22 were undeliverable, yielding a qualified response rate of 48%. Twenty-eight percent of the 100 nonresponse questionnaires mailed were returned. Comparisons between nonrespondents and respondents (n = 380) were made using two independent-sample t- and z-tests for attitude, type of OHV (i.e., ATV, OHM, or SUV) used, and ownership of the land used for riding (P ≤ 0.05). Two attitude questions (one related to each of the two trail use behaviors) revealed no significant differences for attitudes toward either behavior. A significant difference was identified between the proportions of respondents and nonrespondents who rode an ATV (26% of respondents and 7% of nonrespondents; P = 0.045), as well as for their use of federal lands for riding (42% of respondents and 25% of nonrespondents indicated that they rode on federal lands; P = 0.046).

OHV Rider Demographics, Participation, and Experience

Respondents averaged 44 years of age (n = 345) and indicated that they had been riding OHVs for an average of 25 years (n = 379). Most respondents (99%) were OHM riders; 25% rode ATVs and 17% drove jeeps and/or SUVs for recreational purposes. In 2007, respondents rode OHMs an average of 46 days, ATVs an average of 27 days, and four-wheel drive vehicles for recreational purposes an average of 38 days; for all vehicles combined, respondents rode an average of 60 days. Respondents were 97% men and 3% were women (n = 380). Eighteen percent of the respondents were from New York and New Hampshire; 14% were from Connecticut, Massachusetts, and Vermont; and 12% were from Rhode Island; lower percentages were from Maine (9%) and New Jersey (1%), likely because of the low number of members from these states in the original sample. Large percentages of respondents rode their OHVs on private, state, or OHV club/association lands (89, 71, and 60%, respectively), with moderate percentages riding on federal lands (42%) or lands owned by counties, townships, villages, or cities (41%).

With regard to their riding partners, the majority of respondents rode with friends (91%) and/or members of an OHV association (67%); 43% rode with their children, 21% rode with relatives (i.e., other than their children or spouse), and 16% rode with their spouse/significant other. The percentage of respondents riding with their spouse or significant other was greater for those who rode both an ATV and an OHM (38%) when compared with those who only rode an OHM (9%). A slight difference was
also noted for respondents who rode with their children (i.e., 48% of ATV/OHM riders rode with their children compared with 41% of respondents who only rode OHMs).

Respondents were also asked to characterize their participation in trail work and/or maintenance in 2007. More than 70% (265 respondents) reported that they had assisted or were planning to assist with trail projects in 2007. For those who had not yet assisted with trail projects or did not plan on assisting with these projects in 2007, 94% indicated that they would be willing to do so in the future. Individuals who reported participation in some sort of trail work or maintenance in 2007 were also asked to describe the type of land on which they had worked. Sixty-one percent of respondents indicated that they had worked on private lands, 26% had worked on OHV club/association lands, 25% worked on state lands, 9% worked on federal lands, and 3% had worked on other types of lands.

### Attitudes and Intended Behaviors

Attitudes toward the two behaviors were moderately negative (i.e., −0.8 for use of trails on which OHVs are prohibited and −0.6 for the creation and/or use of unauthorized trails; Tables 1 and 2), indicating that the average respondent did not have a favorable perception of either of the two deprecative behaviors. Frequencies indicate that 73% of respondents had a negative mean attitude, 19% were neutral, and 8% had a positive attitude toward OHV use of trails not designated for OHVs. For the creation/use of unauthorized trails, 63% of respondents had a negative attitude, 22% were neutral, and 15% were positive.

On average, riders agreed that they did not intend to participate in either behavior (mean = 0.8 for not intending to use trails on which OHVs are prohibited and for not intending to create/use unauthorized trails). For the OHV use of trails on which OHVs are prohibited, 20% indicated that they intend to use the prohibited trails, 7% were neutral, and 73% indicated that they do not intend to use the prohibited trails. Similar percentages were identified for the creation and/or use of unauthorized trails (i.e., 18% indicated that they intend to create and/or use unauthorized trails, 11% were neutral, and 71% indicated that they do not intend to create and/or use unauthorized trails).

### Management Preferences

OHV riders were asked to indicate their level of preference for various management approaches that could be used to reduce the two trail-related behaviors. For general management strategies (i.e., that apply to OHV use in general), strong preferences were identified for listing regulations at access areas so that riders can easily identify trails designated for OHV use (mean = 1.6) and for educating riders about how they can reduce impacts while riding (e.g., stay on OHV trails only and slow down when passing others; mean = 1.5). Similar responses were provided to questions related to the two trail use behaviors. Overall, informing riders of educational management strategies (i.e., in-
The relationship between attitude and intention was positive, indicating that respondents with positive attitudes toward the depreciative behavior were likely to have a positive intent to engage in the activity; those with negative attitudes were likely to be opposed to engaging in the depreciative behavior. Negative relationships were identified between level of preference for direct management and intention and between age and intention. The more respondents favored the direct management strategies, the more they were opposed to engaging in the depreciative behavior. In addition, as the age of the respondents increased, so did their opposition to engaging in the depreciative behavior. The $R^2$ for this model was 0.426, indicating that a moderate level of variation in the model was explained by the independent variables. Analysis of the partial correlation coefficients reveals that attitude has the strongest relationship with intention of the significant independent variables. In addition, significant correlations ($P < 0.001$) were identified between attitude and age ($r = −0.229$), level of preference for direct management ($r = −0.323$), and level of preference for indirect management ($r = −0.370$); a significant ($P = 0.026$) but slight correlation was identified between attitude and total days of riding in 2007 ($r = 0.116$).
For creating and using unauthorized trails, attitude toward the behavior and indirect management preferences concerning the behavior were significantly related to the intention (Table 3). Although the relationship between attitude and intention was positive, the relationship between level of preference for indirect management and intention was negative. Respondents with positive attitudes toward the deprecative behavior were likely to have a positive intent to engage in the activity, while those with negative attitudes were likely to be opposed to engaging in the deprecative behavior. The negative relationship identified between level of preference for indirect management and intention indicates that the more respondents favored the indirect management strategies, the more they were opposed to engaging in the deprecative behavior. The $R^2$ for this model was 0.400, indicating that a moderate level of variation in the model was explained by the independent variables. Attitude has the strongest relationship with intention of the significant independent variables. Significant correlations ($P < 0.001$) were identified between attitude and age ($r = -0.283$), level of preference for direct management ($r = -0.332$), and level of preference for indirect management ($r = -0.443$); a significant ($P = 0.002$) but slight correlation was identified between attitude and total days of riding in 2007 ($r = 0.158$).

**Discussion**

Obtaining responses about deprecative behaviors is difficult because of the chance that respondents may not wish to acknowledge participation in the behavior. To prevent this type of bias in response, several approaches were used in this study. First, NETRA members were assured of the complete confidentiality of their responses because the researchers did not have access to the mailing list (the researchers guided the NETRA Board of Directors through sample selection, and, although the mailing was conducted by the researchers, it was overseen by NETRA). Members were informed of the steps being taken to maintain their confidentiality through a newsletter article before the survey and through information in the survey cover letter and on the survey itself. The formatting of the questions was also carefully considered. Attitude questions were worded neutrally (e.g., is this behavior good, bad, or neither) and intention questions were asked in a way that would be perceived as positive by respondents (i.e., the respondent does not intend to . . .). Input from OHV riders who reviewed the questionnaire indicated that many respondents would likely choose not to participate in the survey if they thought the questions about intentions were worded in a negative way; for this reason, positive wording of intention questions was necessary to not discourage response. After data collection, frequency distributions were examined to ensure that responses were obtained across the 5-point scale. The reliability of all factors was tested using Cronbach’s alpha; only one factor (respondents’ perceptions of other riders’ intentions toward riding on trails on which OHVs are prohibited; Table 1) was lower than the acceptable level of 0.7. Finally, comparison of nonrespondents’ with respondents’ attitudes indicated no significant difference for attitudes toward either behavior, suggesting that the responses of respondents are likely representative of NETRA members. However, significant differences were noted for the percent of riders who rode an ATV and for those who rode on federal land (both percentages were significantly higher for respondents), indicating that respondents may have more experience related to ATV use and riding on federal land than the average NETRA member.

Results indicate the average respondent from NETRA has a moderately negative attitude toward both of the trail-related behaviors studied and does not plan on engaging in either of the behaviors during a ride. Strong relationships were identified between attitudes and intentions (which were reverse coded) toward each behavior, supporting the attitude–intention relationship identified in the Theory of Planned Behavior. Although the sample is not representative of OHV riders in general, the results indicate that OHV association members in particular may be willing to collaborate with managers on trail efforts that discourage deprecative behaviors. The fact that the majority of respondents have participated in or are willing to participate in trail maintenance work is a strong indicator that this type of collaboration is possible.

Although regression results revealed that attitude has a significant relationship with intention, no significant relationships were identified between intention and years of riding experience or intention and days spent riding in 2007. Age, however, was found to be a significant (and inverse) indicator of intention for OHV use of trails on which OHVs are prohibited (i.e., as age increases, intention decreases). It appears likely that maturation of a rider in general influences intentions more than riding experience and participation. This result also suggests that, in addition to traditional methods for communicating direct and indirect management messages to riders (e.g., signage, brochure, and in-person communications), alternative methods of communication (such as social networks, web-based video, and other technology-based media) may be needed to reach riders of all ages.

With regard to management preferences, educating riders about reducing negative social and environmental impacts (indirect management) was perceived slightly more favorably by respondents than informing riders about ticketing and enforcement of regulations (direct management). In addition, the level of preference for direct management was found inversely related to the intention to use OHVs on trails on which OHVs are prohibited; a similar relationship was identified for the level of preference for indirect management and the intention to create/use unauthorized trails. These results indicate that as the average rider’s preference for a type of management increases, their intention to perform the behavior decreases. Strong correlations between attitudes and preferences for direct and indirect management for both behaviors suggest that management preferences may influence attitudes as well as intentions.

This study also revealed the highly social nature of OHV riding. Most respondents indicated that they normally ride with a partner such as a friend, spouse, or child. However, further study is needed to assess similarities and differences between different types of riders (e.g., OHM and ATV riders) because differences in riding partners were noted between groups (e.g., the percentage of respondents riding with relatives was greater for those who rode both an ATV and an OHM than for those who only rode an OHM).

Finally, it is important to consider the riders included in the sample. Because NETRA’s membership base largely consists of OHM riders (many of whom also ride ATVs and four-wheel-drive vehicles), our results are likely to be more representative of OHM riders than of other OHV riders. In addition, sampling this riding association provides great insight into the perceptions of association members but is likely not representative of nonassociation OHV riders. As-
sociation members, in particular, are dedicated to maintaining access to public lands for riding purposes and are thus supportive of preventing depreciative behaviors because they may perceive these behaviors as leading to public land closures for OHVs. Sampling NETRA does, however, provide managers with important insight into the attitudes and intentions of association members—individuals who would likely wish to collaborate with managers on trail development and maintenance projects in the future.

Conclusion

Reducing negative social and environmental impacts often associated with OHV use while providing quality OHV riding experiences is a difficult balance for forest resource managers to achieve. Only through close collaboration between forest managers and OHV riders can negative public perceptions of OHV riding be changed and negative impacts minimized. Based on the results of this study, several important implications for management should be considered. First, because attitudes and intentions are closely related for each of the two behaviors studied, it is likely that management strategies that seek to change attitudes could influence intentions. The strong correlations between attitudes and preferences for both direct and indirect management suggest that management directed at influencing attitudes may be useful for reducing depreciative trail use behaviors. In addition, using a combination of direct and indirect strategies may be more effective than using only one type of strategy alone.

Second, the inverse relationship between age of rider and intention indicates that as riders age, they are less likely to participate in depreciative trail use behaviors. Although many OHV associations already work to educate their young members about responsible trail use, associations are not able to communicate with OHV riders who are not members. Educating younger and less experienced riders in appropriate trail use behaviors is needed by government agencies at public riding areas. Diverse methods of communication (e.g., media-based and online technologies, onsite personal communications with riders, and educational information at trailheads) will likely be needed to reach riders of all ages.

Third, the social nature of OHV riding was revealed by this study. Because family involvement appears to be an important component of the OHV experience for many riders, considering the different ages, educational levels, and genders of riders is necessary when implementing management strategies. Communicating management messages through associations and at public access sites will likely be most effective for accomplishing management goals.

In summary, the Theory of Planned Behavior was a useful framework for studying the relationships between attitudes and intentions related to OHV use of trails on which OHVs are prohibited and the creation and/or use of unauthorized trails by OHV riders. Although this study provides information that will be useful to forest managers and OHV associations interested in collaborative efforts for trail development and maintenance, further research is needed concerning the other antecedents of intentions. Subjective norms and behavioral controls in particular may be important predictors of trail use intentions because of the highly social nature of OHV use, its dependence on access, and the extensive regulatory climate that exists for OHV riders. Collaboration between riders and managers will be essential in the future for limiting OHV-related impacts and providing quality OHV riding experiences as the demand for use of public land increases in the future.

Literature Cited


