

The Pennsylvania State University
The Graduate School
College of Health and Human Development

**THE INFLUENCE OF LOSS AVERSION ON MOUNTAIN BIKERS'
BEHAVIORAL INTENTIONS**

A Thesis in
Leisure Studies
by
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Submitted in Partial Fulfillment
of the Requirements
for the Degree of

Master of Science

May 2009

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ABSTRACT

Individuals often behave differently in response to potential losses than to potential gains. Specifically, losses loom larger than gains and increase the likelihood individuals will pursue ‘risky’ behaviors in an attempt to mitigate the loss. Additional research has suggested that ownership (real or perceived) underlies the different responses observed in past research. As a result, potential losses, such as the potential loss of recreational access to a site, may be an important motivating factor, for example, in getting the public involved in the management decision making process. However, the majority of studies that address individuals’ aversion to potential losses (aptly termed loss aversion) have been conducted in laboratory settings while the majority of research on public land management has neglected to fully address potential differences in behavior across contexts (i.e., potential losses or potential gains).

To examine the loss aversion phenomenon in a resource-based recreation context, I used a within-subjects experimental design to test whether mountain bikers’ reported intentions differ in a gain based scenario as opposed to a loss based scenario. Participants completed an online survey in which they rated the likelihood they would pursue six different behaviors under two hypothetical access-related scenarios, one loss-based and one gain-based. These data were analyzed using a multi-step repeated measures analysis of variance and repeated measures analysis of covariance. The results suggested that context is an important consideration as the loss-based scenario significantly increased individuals’ intent to pursue such actions. The type of action was also shown to influence behavioral intentions. Furthermore, centrality, used as a proximate measure of ownership, lent support to the claim that it moderates the contextual effects on behavioral intentions.

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INTRODUCTION

Individuals often behave differently towards potential losses than potential gains (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992). Specifically, losses loom larger than gains. Thus, the potential loss of access to a site or area for a desired recreational activity, for example, may be more likely to motivate individuals to get involved in management decision making than a potential gain of access to a new site or area. The public's increased importance in public land management at all levels has required managers to balance access to natural resources for recreation against resource conservation and commodity production (Lawrence & Deagen, 2001). As a result, public involvement in management decision making has received increased attention from researchers and provided insight into the personal and social factors that explain why individuals take civic action (e.g., Parisi, Taquino, Grice, & Gill, 2004; Payton, Fulton, & Anderson, 2005) and how civic action influences management practices (e.g., Hunt & Haider, 2001; Lachapelle & McCool, 2005; Ostrom, 1990). However, these studies have rarely considered potential differences between civic action in the face of potential gains and civic action in the face of potential losses. To examine this phenomenon in a resource-based recreation context, I used a within-subjects experimental design to test whether mountain bikers' reported intentions differ in a gain based scenario as opposed to a loss based scenario.

LITERATURE REVIEW

Loss Aversion

While humans are generally rational, our rationality is “bounded” by constraints resulting from our evolutionary past (Boyd and Richerson, 2005). Rarely do individuals systematically evaluate all decision options and choose the one with the highest expected outcome (Kahneman, 2003). Rather, individuals often adopt various heuristics and biases when seeking information and making decisions (Henrich and McElreath, 2003). As a result, purely logical models often fall short when predicting actual behavior. Gains and losses, for example, are often not evaluated equally, even when they yield equivalent results. For example, Kahneman and Tversky (1984) asked participants to accept or reject two different gambles: gamble A (a 10% chance to win \$95 and a 90% chance to lose \$5) and gamble B (pay \$5 for a 10% chance to win \$100 and a 90% chance to lose nothing). Although the two outcomes are equivalent,¹ 32% of individuals who rejected the first gamble accepted the second.

Prospect theory, developed by Kahneman and Tversky (1979), is founded on the observation that individuals are more sensitive to losses than to gains, termed loss aversion. Referring to the example given above, Kahneman and Tversky (1984) suggest that thinking “of the \$5 as a payment makes the venture more acceptable than thinking of the same amount as a loss” (p. 349). When an individual assesses a decision option, the potential outcome is evaluated against a personal reference point (Kahneman and Tversky, 1979; Tversky and Kahneman, 1981; 1992), which acts as a “measuring stick,” in terms of a gain or a loss. Because decisions are

¹ The expected outcome for each option is \$5:

$$\text{Option A: } (10\% \times \$95) + (90\% \times -\$5) = 9.5 + -\$4.5 = \$5$$

$$\text{Option B: } (-\$5) + (10\% \times \$100) + (90\% \times \$0) = -\$5 + 10 + 0 = \$5$$

reference dependent, different individuals may evaluate the same options differently. Varying reference points, therefore, help account for decision and behavioral differences between individuals who are presented with the same options as well as changes in a single individual's decisions over time. Thus, the utility (i.e., value) of an option varies "with the decision maker's initial state of wealth" (Kahneman, 2003, p. 704). These findings suggest that loss aversion may also prove useful in explaining decisions in a recreational context.

Decisions are made by evaluating the size of the departure from the status quo, with losses and gains treated differently (Novemsky & Kahneman, 2005). In the event of a loss (or a potential loss), individuals are psychologically compelled to return to the equilibrium or reference point. As a result, individuals are more willing to take or pursue a risky option (risk seeking) in order to prevent or reverse a loss. Conversely, individuals are hesitant to take or pursue a risky option (risk averse) in order to achieve a similarly sized gain. While a gain would be desirable, the effort required to achieve the gain represents a risk that outweighs the potential and uncertain benefit(s) making individuals reluctant (i.e., averse) to commit. Therefore, in general, individuals are risk averse with respect to a gain while being risk seeking with respect to a similarly sized loss.

Although prospect theory was originally developed to describe and predict decisions under risk, e.g., gambles or lotteries, Thaler (1980) demonstrated that it also applied to 'riskless' situations. In his initial experiment, Thaler (1980) observed differences between the maximum price participants were willing to pay to buy an item (a coffee mug) and the minimum price participants were willing to accept to sell the same item, the buying price and the selling price of the good, respectively. Thaler (1980) termed the observed overvaluation the endowment effect because it resulted from real or perceived ownership. Consistent with prospect theory, owners of

an item typically request higher selling prices than the buying prices offered by non-owners. Furthermore, in a similar test, individuals given a choice between the mug and various amounts of money mirrored the behavior of the buyers (Tversky & Kahneman, 1981). Thaler (1980) argues that loss aversion explains the observed overvaluation of the item by those who own it. Since this initial application, additional work has provided considerable evidence to support loss aversion and the endowment effect (Brenner, Rottenstreich, Sood, & Bilgin, 2007; Kahneman, Knetsch, & Thaler, 1990; Lin, Chuang, Kao, & Kung, 2006; Novemsky & Kahneman, 2005).

Loss Aversion and Ownership

Many of the interactions between individuals or individuals and groups can be modeled using comparatively simple mathematical and game theoretic models. While such models are clearly abstractions of everyday life, these models have proven to be useful in understanding various aspects of social life (Barash, 2003; Boyd & Richerson, 2005; Maynard Smith, 1982). The game of chicken is particularly relevant to our exploration of loss aversion because of its use in modeling ownership behavior. The concept of the reference point central to loss aversion implicitly includes the status of an individual's current possessions (Sell & Son, 1997). For example, a \$100 plate dinner is valued differently by a corporate CEO than by a coal miner. Losses are psychologically weighted more than gains because they represent departures from the status quo of the individual's stock of possessions.

In the classic version of the game of chicken, two individuals drive vehicles towards one another and the last to swerve from the collision course is declared the winner. Each individual has two options or strategies: (1) swerve (i.e., cooperate) or (2) drive straight at the other (i.e., defect). Clearly, the worst scenario would arise if both individuals choose to defect (drive at the

other), while both would be better off if they cooperate (swerve). However, the temptation to defect persists because, so long as the other swerves, a greater personal outcome can be achieved.

Figure 1 illustrates the game theoretic payoff matrix for chicken (the payoff for player 1 is always shown first for each pair of payoffs). Each player receives the largest payoff (4) when he or she defects while the other player cooperates. If both defect, however, each receives the lowest possible payoff (1). Even though mutual cooperation yields the second-highest payoff (3), the temptation to defect persists. In contrast to other games, such as the prisoner’s dilemma described by Hardin (1968) where the best (purely rational) option is to always defect; the unique qualities of ‘chicken’ do not yield a single best strategy (Barash, 2003). For each player, the best strategy depends on the choice made by the other player. The best strategy, therefore, necessitates relying on external cues that provide credible insight into the other’s future action. Understanding this, players may, for example, promise not to swerve, in an attempt to convince the other of their commitment to stay the course (defect). If successful, the only logical option for the other player would be to swerve (cooperate) because a payoff of two is greater than 1 (see Figure 1). Such actions are common among intraspecific animal combatants as they size up one another (Maier, 1998). In many of these instances, no battle is ever waged and the one who blusters longest wins by default.

		Player 2	
		Cooperate	Defect
Player 1	Cooperate	3, 3	2, 4
	Defect	4, 2	1, 1

Figure 1. Hypothetical payoff matrix for the game of chicken.

Of course, real fights do occur between members of the same species. As individuals interact in staged and real contests, they are basically competing in repeated versions of the game of chicken. Maynard Smith and Price (1973) demonstrated that the best strategy in this case is neither to bluster continuously (but not fight) nor to always fight. Likewise, for any individual, optimality may be reached by employing a combination of such strategies (Maynard Smith & Price, 1973; Maynard Smith & Parker, 1976). Thus, a retaliatory-style strategy (essentially mimicking one's opponent, termed tit-for-tat) may be optimal or nearly optimal when combined with similar strategies (Maynard Smith & Price, 1973; Axelrod, 2006).

Often, however, symmetry of opponents is not a realistic assumption. Two combatants may differ on one or more attributes (e.g., size, skill) or the payoffs to each may differ. In asymmetrical contests, an "asymmetric feature will be taken as a 'cue' by which a contest can be settled conventionally" (Maynard Smith & Parker, 1976, p. 171). One such cue may be ownership. For example, among territorial species the current 'owner' of the territory, or incumbent, typically wins any confrontation, often without any display or fighting (Maier, 1998). Gintis (2007) attributes the evolutionary development of such respect for private property to loss aversion. In order for ownership to serve as a credible cue in confrontation, owners must be predisposed to committing resources to prevent a loss (the endowment effect). Individuals who operate according to loss aversion are naturally committed to such action. As a result, intruders who recognize an individual as the owner would avoid confrontation, knowing the owner is predetermined to commit extra resources in defense of the territory. If individuals were not predisposed to commit resources, ownership could not evolve as a credible cue (Gintis, 2007).

Although “a higher level of resource commitment entails a higher fitness cost, [it] increases the probability of winning the contest” (Gintis, 2007, p. 8).

The animal behavior literature provides excellent examples of this phenomenon, particularly with respect to territoriality and dominance hierarchies (Maier, 1998; Maynard Smith & Parker, 1976). Davies (1978) demonstrated that the speckled wood butterfly is extremely respectful of prior ownership. When confronted by intruders, incumbents display “ownership” by flying in a spiral pattern which prompts intruders to retreat. However, when two butterflies were made to believe they each were the incumbent, a long struggle ensued. Similarly, 80% of the contests between bands of feral horses at watering pools were determined by ownership (Stevens, 1988). Among male-male dyads of hamadryas baboons, prior possession of an item (a food can) trumped dominance as dominant males did not take the item away (Sigg & Falett, 1985).

As Gintis (2007) notes, the value of ownership depends on resource abundance relative to population, resource value, and the availability of “unowned” units of the resource. Thus, the intensity of loss aversion varies across situations (Novemsky & Kahneman, 2005). For example, Kahneman et al. (1991) point out that “loss aversion is expected to primarily affect owners of goods that had been bought for use rather than for eventual resale” (p. 200), highlighting the influence of intentions. When goods are exchanged, loss aversion may be eliminated if the perceived benefits of the exchange items are similar (i.e., substitutable). Reb and Connolly (2007) demonstrated that loss aversion can result from perceived ownership as well as actual ownership. Similarly, loss aversion can result from the simple act of making a choice as when individuals “become attached to the choice options and [then] experience discomfort [loss] once they forgo those options that they did not select” (Carmon, Wertenbroch, & Zeelenberg, 2003, p.

28). Loss aversion is also more likely to be activated as time of ownership (of the object, choice options, etc.) increases (Strahilevitz & Loewenstein, 1998).

Interestingly, when the resource in question is scarce, a private property equilibrium is probabilistically more likely to occur than a non-private property equilibrium (Gintis, 2007), and in a recent study loss aversion was “turned off” when researchers provided the item to both the “buyers” and the “sellers” (Reb & Connelly, 2007). Loss aversion would not be expected to occur, however, for all resources. If the cost of non-ownership is sufficiently high, “intruders” will not refrain from competition thus making any defense of the resource too high for any individual (Gintis, 2007). As a result, no one will be able to claim sole ownership for any appreciable amount of time. Similarly, territoriality can break down under certain conditions, such as when the value of the resource becomes too costly to defend (Maier, 1998). “The attempt to defend a very rich area would require considerable energy and an animal has little or nothing to gain by excluding other animals in such a situation” (Maier, 1998, p. 309). While some may argue that recreation areas may constitute this type of resource, it remains uncertain if this is in fact true.

Loss Aversion and Recreation

The empirical evidence suggests loss aversion can be a powerful motivating factor for the decisions people make and their resulting actions, suggesting that the options available to individuals or how those options are framed, or both, may influence a variety of behaviors in a recreation and leisure setting. For example, if a local municipality were to cut funding from its parks and recreation budget resulting in diminished services, the citizens may protest the reduction in services via voting or other remunerative action. Recreationists who possess unused

permits or face seasonal closures may devote more effort to their respective activities towards the end of the season. Additionally, fishers or hunters who believe they have a right to the fish or game, respectively, may exceed the limit if they feel they can get away with it. Of importance in these examples is that the individuals perceive a potential loss of services, money, time, or resources, respectively. However, as the study of loss aversion is further removed from laboratory contexts, additional factors are likely to influence how likely individuals are to act.

Several studies in recreation have shown that an individual's level of centrality (or involvement) with an activity plays an important role in recreationists' decisions and subsequent behavior (Havitz & Dimanche, 1997; Kim, Scott, & Crompton, 1997; Kyle, Absher, Hammitt & Cavin, 2006). For example, in a study of birders, Kim et al. (1997) found involvement to be correlated with commitment and future intentions. Although conceptualizations of involvement have produced two different scales, one unidimensional and one multi-dimensional, at the core of both measures is the concept of perceived importance (Kim et al., 1997; Mittal, 1995). With respect to loss aversion, individuals for whom the activity is more central or important are likely to use related resources more frequently and not find those resources substitutable with other recreation activities and resources (Ditton & Sutton, 2004). In this respect, centrality may serve as a proxy measure of an individual's perceived ownership of related resources. Such ownership, however, is not of the same type studied in either the loss aversion research or the animal behavior literature because the item in question is publicly, not individually, "owned." Factual ownership, though, is not necessary for individuals to perceive ownership as studies in human territoriality (Taylor, 1988) and psychological ownership (Pierce, Kostova, & Dirks, 2003) demonstrate.

The likelihood that individuals will take action regarding public recreation resources is also likely influenced by the individual's level of civic engagement or activism. Research on civic activism (e.g., participation in community life and public government) and its causation has garnered much attention in the past decade (e.g., Putnam, 2000). These studies have yielded evidence that suggests a combination of general incentives, social capital, and civic voluntarism influence whether or not individuals tend to become involved or take action (Pattie, Seyd, & Whiteley, 2003). Stebbins (2002) suggests that individuals may join organizations or take action in order to address material concerns. In other words, individuals may become engaged as a means of acquiring or solidifying access to recreational resources. In this respect, activism may encompass a variety of personal and social factors (e.g., personal attitudes and social norms) that influence subsequent behavior, particularly those actions related to interacting with public officials or managers. As a result, the tendency of individuals to pursue such behaviors would likely influence their behavioral reactions to loss based and gain based scenarios in a recreation context.

Study Design and Hypotheses

In the past few decades, mountain biking has increased in popularity and many areas have been opened to mountain biking; however, access to trails remains an important issue for many mountain bikers. As a result, mountain bikers will likely respond differently to potential changes in the status of local mountain biking trails. For this study, I chose to test the difference between a gain based scenario and a loss based scenario on the behavioral intentions of mountain bikers. Mountain bikers were chosen because access issues would likely be salient to them. Following a gain based scenario and a loss based scenario six behavioral intentions were asked.

Items were also included to assess participants' general tendency to take action and level of involvement with mountain biking.

In accordance with the loss aversion literature, I predict that, on average, individuals will report higher intentions to act (B) following the loss based scenario (L) than following the gain based scenario (G) (H_1).

$$H_1: B_L > B_G$$

Individuals' willingness to take action will also differ depending on the type of action (where, q = discuss with friends and family; r = seek information about the plan; s = write the management; t = write a legislator; u = attend a management workshop; v = seek information about a local mountain biking organization) (H_2).

$$H_2: B_q \neq B_r \neq B_s \neq B_t \neq B_u \neq B_v$$

Those individuals who receive a gain message first (d) will also report higher intentions to act, on average, than will individuals who receive the loss based message first (f) (H_3).

$$H_3: B_d > B_f$$

Reported behavioral intentions will be influenced by the individual's level of centrality (C) (involvement) and activism (A) (H_4 and H_5).

$$H_4: B \propto C$$

$$H_5: B \propto A$$

Finally, the magnitude of the difference in the reported intentions between the gain and loss scenarios will be moderated by centrality and activism (H_6 and H_7).

$$H_6: B_L - B_G \propto C$$

$$H_7: B_L - B_G \propto A$$

METHODS

I studied the effectiveness of gain based versus loss based scenarios in motivating mountain bikers by using a quasi-experimental within-subjects, or repeated measures, design. Each participant responded to both the gain based and loss based scenarios by reporting how likely he or she would be to take six different actions. Socio-demographic information was collected between the two scenarios in an effort to distract participants from thinking of the previous scenario and minimize any potential carry-over effects. Furthermore, I used a counter balanced design, in which approximately half of the respondents were randomly given the gain message first and the other half received the loss message first, in order to test for any possible order effects. Items assessing the centrality of mountain biking and the tendency of participants to be actively involved in management and mountain biking organizations were included after both scenarios. I chose the within-subjects design in order to optimize our control of confounding variables that would potentially influence responses as described in the literature (e.g., differing reference points, risk preference, propensity to join organizations). A panel of graduate students and faculty from the department were asked to critique the items and questionnaire design. Similarity of the loss based and gain based scenarios were controlled for in terms of length, structure, and strength. The data were collected using the Internet survey site www.surveymonkey.com.

Study Population and Sample

In order to increase the likelihood that the scenario content would be salient to participants, the study population was mountain bikers. Participants were recruited from a local (State College, PA) bicycle shop and three local bicycling organizations. Of the organizations,

only one was specifically a student organization. Participants were also recruited from a national mountain biking organization via its Internet newsletter. A total of 66 participants (10.5%) were recruited specifically from the local area while the remaining 566 participants (89.5%) were recruited from the national organization. Using these sources allowed for variability in the sample although extreme caution should be used in inferring the results to the larger population of mountain bikers (see Table 1 for a description of the sample). However, as my main goal was to test the comparative effectiveness of the two scenarios, this discrepancy is not of immediate concern for my purposes here.

Measurement

To test the comparative effectiveness of gain and loss conditions, participants were asked to consider two different hypothetical scenarios: (a) local public land managers are considering a plan that would open 75 miles of nearby trails to mountain biking and (b) local public land managers are considering a plan that would close 75 miles of nearby trails to mountain biking. Participants' behavioral intentions were measured in each condition with six different behavioral actions. On a seven-point scale, ranging from *extremely likely* (7) to *extremely unlikely* (1), participants were asked to rate how likely they were to (a) discuss the proposed plan with friends and/or family, (b) seek additional information about the management plan, (c) write a letter or email about the plan to management, (d) write a letter or email about the plan to a legislator, (e) seek information about a local mountain biking advocacy organization, and (f) join a local mountain biking advocacy organization.

Table 1.
Descriptive Statistics of the Sample

	<i>n</i>	<i>%</i>
<i>Gender</i>		
Male	573	91.8
Female	51	8.2
<i>Age</i>		
18 – 30	138	21.9
31 – 40	245	39.0
41 – 50	151	24.0
51 – 60	81	12.9
61 – 68	14	2.2
<i>Education</i>		
High School	24	3.8
Some College	113	18.1
Associates/Technical	55	8.8
Bachelors	281	45.0
Masters	110	17.6
PhD/Professional	42	6.7
<i>Household Income</i>		
Less than \$34,999	58	9.5
\$35,000 – \$74,999	187	30.5
\$75,000 – \$114,999	196	32.1
\$115,000 – \$154,999	79	13.0
\$155,000 or more	92	15.0
<i>Biking Preference</i>		
Public Trails	492	79.4
Private Trails	20	3.2
Both	80	12.9
Don't Know/Unsure	28	4.5

The centrality, or importance, of mountain biking was measured with seven items on a seven point scale ranging from *strongly agree* (7) to *strongly disagree* (1). Participants rated how much they agreed that (a) mountain biking is very important to me, (b) mountain biking is one of

the most satisfying things I do, (c) I enjoy mountain biking more than any other recreational activity I do, (d) a lot of my life is organized around mountain biking, (e) mountain biking has a central role in my life, (f) being a mountain biker says a lot about who I am, and (g) when I mountain bike I can really be myself. The likelihood of participants to be active in organizations or with public land management was also assessed. On a seven point scale ranging from *very much like me* (7) to *not very much like me* (1), participants rated the following items: (a) I tend to join organizations, (b) I often donate to organizations, (c) I typically volunteer for organizations, (d) I regularly talk with land managers, and (e) I attend public workshops or meetings.

RESULTS

A multi-step analysis using mixed analysis of variance (ANOVA) and mixed analysis of covariance (ANCOVA) was conducted to test the hypotheses. The initial test was conducted to test for differences in participants' behavioral intentions in the gain and loss scenarios (hypothesis one) and differences in behavioral intentions by type of action (hypothesis four). Additional analyses were then conducted in order to ascertain the relative effects of the centrality and activism variables on the results by including them as covariates (both separately and combined). The initial step consisted of a three-way mixed ANOVA with the gain-loss context and action type as the within-subject factors and the order of the scenarios as the between-subjects factor (yielding a $2 \times 6 \times 2$ level ANOVA). The subsequent steps utilized the same format with the addition of the two covariates (centrality and activism). The data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 16.0.

Reliability of Indices

The reliability of indices was tested by calculating Cronbach's coefficient alpha (see Table 2). For the seven-item index measuring the centrality (or importance) of mountain biking, alpha equaled 0.93. The tendency to be actively involved in management and mountain biking organizations, consisting of a five-item index had an alpha equal to 0.87. For each index, each participant's mean response was calculated and used as a covariate in the repeated measures analysis.

Table 2.
Indices Used to Measure Centrality and Activism

<i>Index</i>	<i>M</i>	<i>SD</i>	<i>Cronbach's α</i>
Centrality	5.76	1.25	0.93
Mountain biking is important to me	6.62	0.99	
Mountain biking is one of the most satisfying things I do	6.51	1.11	
I enjoy mountain biking more than any other recreation activity I do	5.87	1.50	
A lot of my life is organized around mountain biking	5.34	1.61	
Mountain biking has a central role in my life	5.35	1.67	
Being a mountain biker says a lot about who I am	5.07	1.81	
When I mountain bike I can really be myself	5.59	1.64	
Activism	3.77	1.57	0.87
I tend to join organizations	3.95	1.98	
I often donate to organizations	4.10	1.82	
I typically volunteer for organizations	4.23	1.90	
I regularly talk with land managers	3.10	2.02	
I attend public workshops or meetings	3.47	1.93	

Step 1: Effects of Gain and Loss Manipulation

Table 3 provides the results of the repeated measures analysis of variance for the effects of the context manipulation (i.e., gain and loss), the type of action, and the order in which participants received the scenarios (e.g., gain followed by loss or loss followed by gain). The main effects for context and action are both statistically significant ($p < .001$) and of moderate importance ($\eta^2 = .118$ and $.164$, respectively). The interaction of context and the type of action also yield a significant effect ($p < .001$; $\eta^2 = .051$). The effects of scenario order, though statistically significant ($p = .021$), are of no importance ($\eta^2 = .009$). Similarly, the order of the gain and loss scenario interacts minimally with the three main effects.

Table 3.
Repeated Measures Analysis of Variance for the Effects of Gain-Loss Context, Action, and Order on Reported Behavioral Intentions

<i>Source</i>	<i>Type III Sum of Squares</i>	<i>df</i>	<i>Mean Square</i>	<i>F</i>	<i>p</i>	η^2
<i>Between subjects</i>						
Order (OR)	67.90	1	67.90	5.33	.021	.009
Error (Order)	7740.14	608	12.73			
<i>Within subjects</i>						
Gain-Loss (G-L)	1,781.86	1	1,781.86	441.13	< .001	.118
G-L \times OR	33.96	1	33.96	8.41	.004	.002
Error (Gain-Loss)	2,455.92	608	4.04			
Action (AC)	2,468.77	3.46	713.89	291.21	< .001	.164
AC \times OR	52.45	3.46	15.17	6.19	< .001	.003
Error (Action)	5,154.31	2,101.59	2.45			
G-L \times AC	775.08	3.54	218.85	203.97	< .001	.051
G-L \times AC \times OR	25.89	3.54	7.31	6.81	< .001	.002
Error (G-L \times AC)	2,310.38	2,153.30	1.07			

$n = 610$

η^2 values were calculated manually because SPSS only provides partial eta squared values

Table 4 presents the means and standard deviations for each context and each type of action. Overall, individuals are more likely to act in a loss condition than a gain condition (mean = 6.17 and 5.18, respectively). The type of action to be undertaken is also a significant factor in the overall likelihood participants will act. In general, participants are most likely to discuss the plan with friends and family (mean = 6.50) followed by seeking information about the plan (mean = 6.37), seeking information about a local mountain biking organization (mean = 5.66), attending a public workshop (mean = 5.34), writing to the management (mean = 5.30), and writing to a legislator (mean = 4.89).

The interaction effect for context and action (G-L \times AC) shows that the change in behavioral intentions observed between the gain and loss scenarios was different depending on the type of action. The data in Table 4 show that the change in reported behavioral intentions between the gain context and the loss was greatest for writing to a legislator (difference = 1.96),

followed by writing to the management (difference = 1.7), attending a public workshop (difference = 0.97), and seeking information about a local mountain biking organization (difference = 0.82). Overall, participants' were less likely to differ across contexts in their reported intentions to discuss the plan with friends and family (difference = .21) or to seek information about the plan (difference = .31). Interestingly, the standard deviations for each behavior are smaller in the loss context than in the gain context. When combined, the main effects for context and action and their interaction explain a moderate amount of the variance observed in the data (combined $\eta^2 = .333$).

Table 4.
Behavioral Intention Item Means and Standard Deviations for Gain and Loss Contexts

<i>Item</i>	<i>Gain Scenario</i>		<i>Loss Scenario</i>		<i>Overall Action Means</i>
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	
Discuss with friends and family	6.40	1.23	6.61	1.00	6.50
Seek information about the plan	6.22	1.28	6.53	1.01	6.37
Write to management	4.47	2.03	6.17	1.39	5.30
Write to legislator	3.93	2.04	5.89	1.57	4.89
Attend a public workshop held my management	4.86	1.88	5.83	1.57	5.34
Seek information about a local mountain biking organization	5.25	1.78	6.07	1.51	5.66
<i>Overall Context Means:</i>	5.18		6.17		

n = 610

Step 2: Effects of the Full Model

Table 5 presents the results of the repeated measures analysis of covariance for the effects of the context manipulation (i.e., gain and loss), the type of action, and the order in which participants received the scenarios along with centrality and activism added as covariates. The main effects for context and action are both statistically significant ($p < .001$). However, the importance of both variables decreases. Context is no longer important ($\eta^2 = .006$) while the type

of action remains at least minimally important ($\eta^2 = .037$). The interaction of context and the type of action also yields a statistically significant but unimportant interaction effect ($p < .001$; $\eta^2 = .003$). Additionally, the effects of scenario order, though statistically significant ($p = .006$), are of minor, if any, importance ($\eta^2 = .009$). Similarly, the order of the gain and loss scenario interacts minimally with the three main effects. Thus, when both centrality and activism are included as covariates the observed differences in individuals' likelihood to act associated with the context and type of action are only of minor, if any, importance.

Table 5.
Repeated Measures Analysis of Variance for the Effects of Gain-Loss Context, Action, Centrality, Activism, and Order on Reported Behavioral Intentions

<i>Source</i>	<i>Type III Sum of Squares</i>	<i>df</i>	<i>Mean Square</i>	<i>F</i>	<i>p</i>	η^2
<i>Covariates</i>						
Centrality (CE)	740.78	1	740.78	84.72	< .001	.101
Activism (AV)	1,239.06	1	1,239.06	141.71	< .001	.169
<i>Between subjects</i>						
Order (OR)	66.41	1	66.41	7.60	.006	.009
Error (between & covariates)	5,298.50	606	8.74			
<i>Within subjects</i>						
Gain-Loss (G-L)	60.92	1	60.92	16.11	< .001	.006
G-L \times CE	42.33	1	42.33	11.20	.001	.004
G-L \times AV	146.60	1	146.60	38.77	< .001	.014
G-L \times OR	29.61	1	29.61	7.83	.005	.003
Error (Context)	2,291.30	606	3.78			
Action (AC)	387.82	3.53	109.79	49.58	< .001	.037
AC \times CE	89.14	3.53	25.24	11.40	< .001	.008
AC \times AV	307.17	3.53	86.96	39.27	< .001	.029
AC \times OR	57.36	3.53	16.24	7.33	< .001	.005
Error (Action)	4,740.26	2,140.54	2.22			
G-L \times AC	32.12	3.60	8.93	8.63	< .001	.003
G-L \times AC \times CE	14.57	3.60	4.05	3.92	.005	.001
G-L \times AC \times AV	46.72	3.60	13.00	12.55	< .001	.004
G-L \times AC \times OR	26.09	3.60	7.26	7.01	< .001	.002
Error (G-L \times AC)	2,255.52	2,178.85	1.04			

$n = 610$

η^2 values were calculated manually because SPSS only provides partial eta squared values

In the full model, both covariates, centrality and activism, are statistically significant ($p < .001$) and moderately important predictors of individuals' overall likelihood to act ($\eta^2 = .101$ and $.169$, respectively). Both covariates yield significant interaction effects with context, action, and the interaction of context and action although the majority are of no importance. In fact, aside from the main effect for action, the only within-subjects factors of any importance are the interaction effects of activism and context and activism and action ($\eta^2 = .014$ and $.029$, respectively).

Step 3: Effects of Centrality

As indicated in the literature, centrality was included as a proximate measure of perceived ownership. I conducted a third analysis to ascertain the effects centrality in the absence of activism. Table 6 provides the results of the Repeated Measures ANCOVA using centrality as the lone covariate. Unlike the initial analysis, the main effect for context, though still statistically significant, is no longer important ($p = .026$; $\eta^2 = .002$). A similar result is obtained for the main effect of the type of action ($p < .001$; $\eta^2 = .025$) and the interaction of the context and type of action ($p = .002$; $\eta^2 = .002$). These results suggest that centrality is an important factor underlying the initial observed change in behavior from the gain based scenario to the loss based scenario and across the different possible action types.

Table 6.
Repeated Measures Analysis of Variance for the Effects of Gain-Loss Context, Action, Centrality, and Order on Reported Behavioral Intentions

<i>Source</i>	<i>Type III Sum of Squares</i>	<i>df</i>	<i>Mean Square</i>	<i>F</i>	<i>p</i>	η^2
<i>Covariates</i>						
Centrality (CE)	1,202.59	1	1,202.59	11.66	< .001	.154
<i>Between subjects</i>						
Order (OR)	54.06	1	54.06	5.02	.025	.007
Error (between & covariates)	6,537.55	607	10.77			
<i>Within subjects</i>						
Context (G-L)	19.97	1	19.97	4.97	.026	.002
G-L × CE	18.02	1	18.02	4.49	.035	.002
G-L × OR	32.69	1	32.69	8.14	.004	.003
Error (Context)	2,437.90	607	4.02			
Action (AC)	256.35	3.43	74.76	30.83	< .001	.025
AC × CE	106.88	3.43	31.17	12.85	< .001	.010
AC × OR	53.69	3.43	15.66	6.46	< .001	.005
Error (Action)	5,047.44	2,081.26	2.43			
G-L × AC	17.15	3.54	4.84	4.52	.002	.002
G-L × AC × CE	8.14	3.54	2.30	2.15	.081	.001
G-L × AC × OR	25.68	3.54	7.25	6.78	< .001	.002
Error (G-L × AC)	2,302.24	2,150.42	1.07			

$n = 610$

η^2 values were calculated manually because SPSS only provides partial eta squared values

Step 4: Effects of Activism

I also conducted a final analysis using Repeated Measures ANCOVA with activism as the only covariate in order to ascertain its effects independent of those for centrality. These results are presented in Table 7. In this analysis, the three within-subjects main effects remain statistically significant and minimally important: context ($p < .001$; $\eta^2 = .057$), the type of action ($p < .001$; $\eta^2 = .010$), and the interaction of the scenario and action type ($p < .001$; $\eta^2 = .021$).

The interaction effects of activism with context and action are also statistically significant but of

minimal importance. These findings indicate that activism is an important factor overall but less important in predicting the change in behavior related to the context or type of action.

Table 7.
Repeated Measures Analysis of Variance for the Effects of Gain-Loss Context, Action, Activism, and Order on Reported Behavioral Intentions

<i>Source</i>	<i>Type III Sum of Squares</i>	<i>df</i>	<i>Mean Square</i>	<i>F</i>	<i>p</i>	η^2
<i>Covariates</i>						
Activism (AV)	1,700.87	1	1,700.87	170.95	< .001	.217
<i>Between subjects</i>						
Order (OR)	80.17	1	80.17	8.06	.005	.010
Error (between & covariates)	6,039.28	607	9.95			
<i>Within subjects</i>						
Context (G-L)	701.82	1	701.82	182.55	< .001	.057
G-L × AV	122.29	1	122.29	31.81	< .001	.010
G-L × OR	31.76	1	31.76	8.26	.004	.003
Error (Context)	2,333.63	607	3.845			
Action (AC)	1,218.46	3.54	344.24	153.15	< .001	.010
AC × AV	324.92	3.54	91.80	40.84	< .001	.027
AC × OR	55.08	3.54	15.56	6.92	< .001	.005
Error (Action)	4,829.40	2,148.51	2.25			
G-L × AC	262.15	3.58	73.15	70.10	< .001	.021
G-L × AC × AV	40.29	3.58	11.24	10.77	< .001	.003
G-L × AC × OR	26.21	3.58	7.31	7.01	< .001	.002
Error (G-L × AC)	2,270.09	2,175.40	1.04			

$n = 610$

η^2 values were calculated manually because SPSS only provides partial eta squared values

DISCUSSION

The results presented in this paper were derived from multiple steps of analysis. The initial step consisted of a three-way analysis of variance (two within-subjects and one between-subjects) to test whether or not the loss aversion phenomenon translates from the laboratory to real world settings. As such, the initial analysis tested only the differences in individuals' reported behavioral intentions between gain and loss scenarios (contexts) and across the types of behavior (action). In subsequent analyses (steps two, three, and four) variables measuring individuals' level of centrality and level of activism were added as covariates to better understand the impact of these constructs on the observed changes in reported behavioral intentions. Overall, the results of these analyses provide support to hypotheses one, two, four and five and limited support, at best, to hypotheses three, six, and seven.

According to the results of the initial analysis, the gain or loss context has a significant influence on individuals' reported behavioral intentions, supporting the first hypothesis (H_1). The likelihood individuals will pursue various behaviors is, on average, higher in the loss context than in the gain context. Furthermore, the influence of the gain and loss context remains regardless of the specific action in question as the means for each action are significantly higher in the loss scenario than for gain scenario. Thus, consistent with the literature, the contextual factors (i.e., the presence of a potential loss or a potential gain) surrounding a decision to act are important considerations.

The results also suggest, however, that some behaviors are more affected by the gain-loss condition than others. While all reported behavioral intentions increased from the gain context to the loss context, some behaviors elicited marked increases in participant intent. For example, while participants rated the likelihood they would 'write to the management' or 'write to a

legislator' the lowest in a gain context, in a loss context both received much higher ratings.

These results suggest that those behaviors most likely to directly affect (mitigate) the potential loss experience the greatest change between contexts.

Consistent with hypothesis two (H_2), the results support the claim that participants will differ, on average, in their likelihood to pursue the six different behaviors (actions). These findings suggest that those behaviors requiring less effort (e.g., discuss with friends and family) are, on average, more likely to be pursued than those requiring more effort (e.g., write to a legislator). Additionally, while the means for each action are above the mid-point of the scale (i.e., 4), the generally low means for the more effortful actions (e.g., writing to a legislator, writing to the management) suggest that, in general, we should expect individuals to be less likely to pursue these actions under normal conditions.

As predicted, the order in which participants saw the gain and loss scenarios (H_3) is statistically significant but of no importance. Although interaction effects for order are statistically significant, their importance is dubious at best. Further complicating these findings is the fact that in this study the two scenarios were presented rather closely to one another within the same survey, suggesting that, given more time between them, the effects of scenario order may disappear entirely.

Given the findings of the initial analysis, additional tests were conducted in order to ascertain the effects of the gain-loss context and the type of action when individuals' level of centrality and level of activism were held constant. These tests are important because researchers studying the effects of loss aversion have typically induced ownership and a few studies suggest that the observed change in behavior is dependent on an individual's level of ownership (Reb & Connelly, 2007; Strahilevitz & Loewenstein, 1998). In this study, I used the individual's level of

centrality (importance) with mountain biking as a proximate measure of ownership. Activism was also included because the literature indicates that it influences the likelihood individuals will pursue (or make plans to pursue) such behaviors.

When centrality and activism are included in the model as covariates, all previous main effects and interactions remain statistically significant although the importance of all main effects is greatly reduced. Of the within-subjects factors, action remains the only main effect of any notable importance. Interaction effects for activism and context and activism and action are also of only minimal importance. In other words, when centrality and activism are held constant, there is little observed variation between the scenarios and between the different actions. What variation that does remain depends predominantly, though minimally, on the level of activism.

The main effects of the covariates centrality and activism (H_4 and H_5 , respectively) are statistically significant and important in predicting individuals' overall likelihood of acting. Together, the main effects of the covariates account for 27% of the observed variance in overall likelihood to act across contexts. In other words, activism is a more powerful predictor of individuals' likelihood to pursue different actions, although centrality is also an important predictor. It should be noted that interaction effects of centrality and activism could not be assessed with this model as both were treated as covariates.

Separate tests of the covariates were done to parcel out the effects of each covariate (Steps 3 and 4, respectively). When centrality alone was included in the analysis, only action and the interaction of action and centrality remain of at least minimal importance. Interestingly, context accounts for even less of the observed variance. The presence of activism alone in the model yields important results for five items. Interestingly, context is important and is more

important than in the two previous analyses using covariates. Additionally, the action and action/context interaction main effects are also of at least minimal significance.

These findings suggest that, concurrent with the literature, centrality may have more of an effect on the changes in behavioral intent between contexts than does activism. Additionally, it is important to remember that most studies of loss aversion induce ownership in laboratory settings and the observed effects of centrality serve as a check on its role. The inclusion of activism alone provides the smallest effect for action, suggesting that it may influence the type of behavior pursued more than centrality. The interaction of activism with context and action are also important. Interestingly, the type of action remains at least minimally important across the analyses while the context appears to be more easily influenced by the presence of the covariates. These results provide support to the idea that the gain-loss context is dependent on other factors and malleable depending on the situation.

The results of this study yield several implications for managers of public lands and recreational organizations. First, resource managers should be aware of the effects of potential losses when developing new management strategies and/or guidelines. Loss-based strategies may, also, prove useful when justifying changes to fees and other pricing strategies. Additionally, managers should be aware of the role ownership plays in influencing behavior. Second, the data suggest that loss-based messages may be more persuasive than other forms of advertisement. In fact, some organizations, knowingly or not, employ such tactics as part of recruitment or activism-oriented campaigns.

Of course, the effect of potential losses on actual behavior in real world settings remains to be seen. As C. Wright Mills (1940) noted, individuals' behavior often differs from their intentions (what they say they will do) or prescribed social norms (what their culture tells them

to do). While research (e.g., Armitage & Conner, 2001) does suggest that behavioral intentions are correlated with actual behavior, caution is warranted in projecting the results presented here to actual behavior. This study is a step in translating loss aversion from the laboratory to the real world. As is the case with many laboratory studies, previous research on loss aversion has lacked external validity. The present study partially corrects for this shortcoming by developing a more realistic, although hypothetical, context within which to study loss aversion. Future research should address the concerns raised here about external validity and the assessment of actual behavior in order to test the boundaries and causal factors surrounding loss aversion outside the laboratory. Of these factors, the results presented here suggest that additional attention should be directed towards understanding ownership and its role in loss aversion. As a final caveat it should be noted that potential ceiling effects may obscure the results obtained in this study and more robust measures, such as actual behavior or using more sensitive psychometric scales, may yield more powerful results.

CONCLUSION

While a large body of literature supporting the presence of loss aversion exists in the psychology and consumer research literature, few studies have extended the theory into real world settings. The present study lends support to the claim that the loss aversion phenomenon exists outside the laboratory. Individual mountain bikers reported marked differences in their intention to act in a loss-based scenario as compared to a gain-based scenario. Individual responses were also influenced, both in general and between scenarios, by the type of action under consideration. Further, the data also suggest that individuals' level of centrality, serving as a proxy measure of ownership, plays a role in accounting for the observed change in behavioral intent. Future research should address the role of loss aversion and the extent to which it influences recreationists' decision making and actual behavior. Additional research should also be directed at understanding the concept of ownership and its role in recreationists' perceptions and behavior. As these issues are currently of interest to psychologists and other researchers, the opportunity exists to build upon and contribute to mutually beneficial research across disciplinary boundaries.

REFERENCES

- Armitage, C.J. & Conner, M. (2001). Efficacy of the theory of planned behavior: A meta-analytic review. *British Journal of Social Psychology*, 40(4), 471-499.
- Axelrod, R. (2006). *The evolution of cooperation* (revised edition). New York: Basic Books.
- Barash, D.P. (2003). *The survival game: How game theory explains the biology of cooperation and competition*. New York: Owl Books.
- Boyd, R., & Richerson, P.J. (2005). *The origin and evolution of cultures*. Oxford, UK: Oxford University Press.
- Carmon, Z., Wertenbroch, K., & Zeelenberg, M. (2003). Option attachment: When deliberating makes choosing feel like losing. *Journal of Consumer Research*, 30, 15-29.
- Davies, N.B. (1978). Territorial defence in the speckled wood butterfly (*Pararge aegeria*): The resident always wins. *Animal Behaviour*, 26, 138-147.
- Ditton, R.B., & Sutton, S.G. (2004). Substitutability in recreational fishing. *Human Dimensions of Wildlife*, 9, 87-102.
- Gintis, H. (2007). The evolution of private property. *Journal of Economic Behavior and Organization*, 64, 1-16.
- Henrich, J., & McElreath, R. (2003). The evolution of cultural evolution. *Evolutionary Anthropology*, 12, 123-135.
- Hunt, L., & Haider, W. (2001). Fair and effective decision making in forest management planning. *Society and Natural Resources*, 14(10), 873-887.
- Kahneman, D., Knetsch, J.L., & Thaler, R.H. (1991). Anomalies: The endowment effect, loss aversion, and status quo bias. *Journal of Economic Perspectives*, 5(1), 193-206.

- Kahneman, D. & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, 47(2), 263-292.
- Kahneman, D. (2003). A perspective on judgment and choice: Mapping bounded rationality. *American Psychologist*, 58(9), 697-620.
- Kim, S., Scott, D., & Crompton, J.L. (1997). An exploration of the relationships among social psychological involvement, behavioral involvement, commitment, and future intentions in the context of birdwatching. *Journal of Leisure Research*, 29(3), 320-341.
- Kyle, G.T., Absher, J.D., Hammitt, W.E., & Cavin, J. (2006). An examination of the motivation-involvement relationship. *Leisure Sciences*, 28, 467-485.
- Lawrence, R.L. & Deagen, D.A. (2001). Choosing public participation methods for natural resources: A context-specific guide. *Society and Natural Resources*, 14, 857-872.
- Lachapelle, P.R., & McCool, S.F. (2005). Exploring the concept of “ownership” in natural resource planning. *Society and Natural Resources*, 18, 279-285.
- Maier, R. (1998). *Comparative animal behavior: An evolutionary and ecological approach*. Boston, MA: Allyn and Bacon.
- Maynard Smith, J. (1982). *Evolution and the theory of games*. Cambridge, UK: Cambridge University Press.
- Maynard Smith, J., & Parker, G.A. (1976). The logic of asymmetric contests. *Animal Behaviour*, 24, 159-175.
- Maynard Smith, J., & Price, G.R. (1973). The logic of animal conflict. *Nature*, 246, 15-18.
- Mills, C.W. (1940). Methodological Consequences of the Sociology of Knowledge. *The American Journal of Sociology*, 46, 316-330.

- Novemsky, N., & Kahneman, D. (2005). The boundaries of loss aversion. *Journal of Marketing Research*, 42, 119-128.
- Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action*. Cambridge, UK: Cambridge University Press.
- Parisi, D., Taquino, M., Grice, S.M., & Gill, D.A. (2004). Civic responsibility and the environment: Linking local conditions to community environmental activeness. *Society and Natural Resources*, 17(2), 97-112.
- Payton, M.A., Fulton, D.C., & Anderson, D.H. (2005). Influence of place attachment and trust on civic action: A study of Sherburne National Wildlife Refuge. *Society and Natural Resources*, 18(6), 511-528.
- Pierce, J.L., Kostova, T., & Dirks, K.T. (2003). The state of psychological ownership: Integrating and extending a century of research. *Review of General Psychology*, 7(1), 84-107.
- Reb, J. & Connolly, T. (2007). Possession, feelings of ownership and the endowment effect. *Judgment and Decision Making*, 2(2), 107-114.
- Sell, J. & Son, Y. (1997). Comparing public goods and common pool resources: Three experiments. *Social Psychology Quarterly*, 60(2), 118-137.
- Sigg, H. & Falett, J. (1985). Experiments on respect of possession and property in hamadryas baboons (*Papio hamadryas*). *Animal Behaviour*, 33, 978-984.
- Stevens, E.F. (1988). Contests between bands of feral horses for access to fresh water: The resident wins. *Animal Behaviour*, 36, 1851-1853.

Taylor, R.B. (1988). *Human territorial functioning: An empirical, evolutionary perspective on individual and small group territorial cognitions, behaviors, and consequences.*

Cambridge, UK: Cambridge University Press.

Thaler, R. (1980). Toward a positive theory of consumer choice. *Journal of Economic Behavior and Organization*, 1, 39-60.

Tversky, A., & Kahneman, D. (1981). Loss aversion in riskless choice: A reference-dependent model. *Quarterly Journal of Economics*, 106, 1039-1061.

Tversky, A. and Kahneman, D. 1992. Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and Uncertainty* 5:297-323.

APPENDIX A
SURVEY INSTRUMENT

SECTION A: Please tell us a few things about your mountain biking experience.

1. What is/are your preferred type(s) of mountain biking? *Check all that apply.*

- Dirt or gravel forest roads
- Dirt or gravel trails (single track)
- Highly technical trails (with obstacles such as rocks, logs, and/or ramps)
- Paved trails

2. How long has it been since you last went mountain biking? *Check only one.*

- In the last week
- 1 - 4 weeks ago
- 1 - 3 months ago
- 4 - 6 months ago
- 7 - 12 months ago
- More than 12 months ago

3. How many times have you been mountain biking during the past 12 months?

_____ times

4. How many different trails have you mountain biked on during the past 12 months?

_____ trails

5. Do you mountain bike predominantly on public or private lands?

- Public
- Private
- Both Equally
- Unsure/Don't Know

6. When do you plan to go mountain biking next?

- In the next week
- 1 - 4 weeks from now
- 1 - 3 months from now
- 4 - 6 months from now
- 7 - 12 months from now
- More than 12 months from now
- Never

SECTION B: Please read the following scenario and think about what the situation would be like for you. Then respond to the questions that follow.

You have learned that local public land managers are considering a plan that would close 75 miles of nearby trails to mountain biking. If this plan is approved, you will no longer be permitted to mountain bike on these trails.

1. Given the above scenario, how likely is it you would do each of the following?

	Extremely unlikely					Extremely likely	
A. Discuss this proposed plan with friends and/or family	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B. Seek additional information about the management plan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C. Write a letter or email about the plan to management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D. Write a letter or email about the plan to a legislator	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E. Attend a public workshop held by the management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F. Seek information about a local mountain biking advocacy organization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
G. Join a local mountain biking advocacy organization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. Given the above scenario, how likely is it you would do each of the following for a local mountain biking advocacy organization?

	Extremely unlikely					Extremely likely	
A. Trail maintenance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B. Write a letter or email	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C. Do office work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D. Raise money	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E. Provide expertise	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F. Recruit new members	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. The membership fee for a local mountain biking advocacy organization last year was \$20. Given the above scenario, how much would you be willing to pay to become a member of this organization? \$_____

4. The average donation to a local mountain biking advocacy organization last year was \$25.
Given the above scenario, how much would you be willing to donate to this organization?
\$_____

5. Given the above scenario, to what extent would you feel...

	Not at All	Slightly	Moderately	Extremely	Not Sure
A. Surprised?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B. Apprehensive?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C. Accepting?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D. Happy?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E. Angry?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F. Interested?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
G. Disgusted?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
H. Sad?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SECTION C: Think about what the following situation would be like for you and respond to the question that follows.

After learning about a proposal to close 75 miles of nearby trails to mountain biking, you find out that in two weeks public land managers are going to hold a meeting about trail use. Managers have invited mountain biking, hiking, and horseback riding representatives to serve as the voice for each activity. Managers will use the results of this meeting to determine how to allocate resources for each activity in their new five-year management plan.

1. The managers conducting this meeting are interested in your opinion about resource allocation. Using 100 total points to represent resources, please distribute the points among the trail-based recreation activities below (mountain biking, hiking, and horseback riding). For example, if you feel activity A should receive twice as many resources as activity B, then assign activity A twice as many points.

Mountain bikers _____ Hikers _____ Horseback riders _____

SECTION D: We would like to know more about yourself. Please answer the following questions about your background.

1. In what year were you born? 19_____

2. What is your gender?

- Male
 Female

3. In which town and state do you currently reside? _____
Township/Borough State

4. How long have you lived in this community? _____ months _____ years

5. Is this your permanent residence?

- Yes
 No

6. What is the highest level of school that you have completed?

- High School Bachelors Degree
 Some College Masters Degree
 Associates Degree PhD

7. Approximately what was your total household income (before taxes) for 2007?

- Less than \$15,000 \$95,000 - \$114,999
 \$15,000 - \$34,999 \$115,000 - \$134,999
 \$35,000 - \$54,999 \$135,000 - \$154,999
 \$55,000 - \$74,999 \$155,000 - \$174,999
 \$75,000 - \$94,999 \$175,000 or more

SECTION E: Please read the following scenario and think about what the situation would be like for you. Then respond to the questions that follow.

You have learned that local public land managers are considering a plan that would open 75 miles of nearby trails to mountain biking. If this plan is approved, you will be permitted to mountain bike on these existing trails.

1. Given the above scenario, how likely is it you would do each of the following?

	Extremely unlikely					Extremely likely	
A. Discuss this proposed plan with friends and/or family	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B. Seek additional information about the management plan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C. Write a letter or email about the plan to management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D. Write a letter or email about the plan to a legislator	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E. Attend a public workshop held by the management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F. Seek information about a local mountain biking advocacy organization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
G. Join a local mountain biking advocacy organization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. Given the above scenario, how likely is it you would do each of the following for a local mountain biking advocacy organization?

	Extremely unlikely					Extremely likely	
A. Trail maintenance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B. Write a letter or email	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C. Do office work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D. Raise money	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E. Provide expertise	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F. Recruit new members	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. The membership fee for a local mountain biking advocacy organization last year was \$20. Given the above scenario, how much would you be willing to pay to become a member of this organization? \$_____

4. The average donation to a local mountain biking advocacy organization last year was \$25.
Given the above scenario, how much would you be willing to donate to this organization?
\$_____

5. Given the above scenario, to what extent would you feel...

	Not at All	Slightly	Moderately	Extremely	Not Sure
A. Surprised?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B. Apprehensive?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C. Accepting?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D. Happy?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E. Angry?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F. Interested?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
G. Disgusted?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
H. Sad?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SECTION F: Please answer the following questions.

1. How well does each statement describes you?

	Not very much like me					Very much like me	
A. I tend to join organizations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B. I often donate to organizations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C. I typically volunteer for organizations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D. I regularly talk with land managers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E. I attend public workshops or meetings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. How many outdoor organizations (any type) are you a member of?

<input type="checkbox"/> 0 Memberships	<input type="checkbox"/> 7-9 Memberships
<input type="checkbox"/> 1-3 Memberships	<input type="checkbox"/> 10-12 Memberships
<input type="checkbox"/> 4-6 Memberships	<input type="checkbox"/> More than 12 memberships

3. Please indicate your level of agreement with the following statements describing how you feel about mountain biking.

	Strongly disagree					Strongly agree	
A. Mountain biking is very important to me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B. Mountain biking is one of the most satisfying things I do	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C. I enjoy mountain biking more than any other recreational activity I do	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D. A lot of my life is organized around mountain biking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E. Mountain biking has a central role in my life	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F. Being a mountain biker says a lot about who I am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E. When I mountain bike I can really be myself	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Please rate how strongly you personally agree or disagree with the following statements.

	Strongly disagree					Strongly agree	
A. I have a lot of options when deciding where to go mountain biking.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B. I have a right to use public trails and old roadways for biking.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C. Access to trails for mountain biking is an important issue.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Please rate how strongly you think other mountain bikers agree or disagree with the following statements.

	Strongly disagree					Strongly agree	
A. There are a lot of options when deciding where to go mountain biking.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B. They have a right to use public trails and old roadways for biking.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C. Access to trails for mountain biking is an important issue.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. How important are the following trail-related activities to you?

	Extremely unimportant					Extremely important	
A. Hiking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B. Horseback riding	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C. Driving ATVs or off-road vehicles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D. Mountain biking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E. Backpacking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F. Sightseeing, viewing scenery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
G. Cross country skiing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
H. Snowshoeing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I. Snowmobiling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**This Concludes Our Questionnaire.
Thanks Again For Your Help!**

APPENDIX B
INFORMED CONSENT

PENNSSTATE



Principal Investigator:

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Advisor:

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1. Purpose of the Study:

In the past few decades, mountain biking has increased in popularity and many new mountain biking areas have been opened. However, access to trails for biking can be problematic and remains an important issue. This questionnaire asks your opinion about mountain biking and access to trails for mountain biking.

2. Procedures to be followed:

You will be directed to the Survey Monkey Internet survey site and asked to read three scenarios about mountain biking and answer questions for each scenario. You will also be asked to answer questions about your mountain biking experience and opinions about the activity.

3. Duration/Time:

Completing the survey will take between 15 and 20 minutes.

4. Statement of Confidentiality:

Your participation in this research is confidential. The survey does not ask for any information that would identify who the responses belong to. Your confidentiality will be kept to the degree permitted by the technology used. No guarantees can be made regarding the interception of data sent via the Internet by any third parties. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared because your name is in no way linked to your responses. All data will be grouped for reporting purposes.

5. Right to Ask Questions:

This survey is being conducted by Andrew Purrington and Harry Zinn in the Department of Recreation, Park and Tourism Management at Penn State University. If you have questions or want to know more about the survey, please contact Andrew Purrington at (814) 867-1730.

6. Voluntary Participation:

Your participation in this study is completely voluntary; you may choose not to participate, or you may quit at any time. You do not have to answer any questions you do not want to answer.

You must be 18 years of age or older to take part in this research study. Completion of the survey implies that you have read the information in this form and consent to take part in the research. Please print and keep a copy of this form for your records or future reference.

APPENDIX C

PARTICIPANT RECRUITMENT SCRIPT

Mountain biking has become very popular, but access to trails remains an important issue. Andrew Purrington and Harry Zinn in the Department of Recreation, Park and Tourism Management at Penn State University are conducting a study of mountain bikers' perceptions and are asking for your help completing a 15-minute online questionnaire about mountain biking issues.

Your opinion is important, and results of the study may help mountain biking advocates learn how to be more effective. Participation in this study is completely voluntary; you may choose not to participate, or you may quit at any time. All of your answers are confidential. Specific individual responses will not be reported. All data will be grouped for reporting purposes.

If you are willing to participate in this study, please visit: [link to site goes here.](#)

If you have questions or want to know more about the survey, you can contact Andrew Purrington:

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