

Improving the Efficacy of Visitor Education in Haleakalā National Park Using the Theory of Planned Behavior

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Abstract

Degradation of resource and experiential quality from recreational use at the Pools of `Ohe`o in Haleakalā National Park has led officials to discourage visitor use of the area. Using the Theory of Planned Behavior (TPB), this study examines relationships among visitors' attitudes, subjective norms, and perceived control regarding exploration of the pools, their intentions to explore and their actual behaviors at pools. Further, the study examines the influence of persuasive messages on visitors' behavior at the pools. TPB is found to be an effective model for understanding visitor behavior at `Ohe`o's

Pools, revealing a desire among visitors to act in accordance with National Park Service wishes. Results indicate that attitudes and subjective norms are influenced by exposure to the persuasive messages. Additionally, messages emphasizing the resource impacts of exploring the pools are found to be more effective at influencing visitor attitudes than messages emphasizing the dangers of exploring the pools.

Introduction

Visitor education and information are commonly used to minimize and prevent social and environmental impacts of recreation in national parks and related protected natural areas (Ham et al., 2008; Marion & Reid, 2007). They are the generally preferred recreation management approach of both visitors and managers, largely because they are perceived as unobtrusive and consistent with experiential values associated with natural resource-based recreation on public lands, and are often less costly than other management tactics (Bullock & Lawson, 2007; Hendee & Dawson, 2002; Manning, 1999; Martin, Marsolais, & Rolloff, 2009; Park, Manning, Marion, Lawson, & Jacobi, 2008; Roggenbuck, 1992; Vistad, 2003). Furthermore, the use of visitor education and information has proven to be effective at reducing a variety of undesirable behaviors in park settings, including off-trail hiking, animal feeding, theft of petrified wood, and littering (Bradford & McIntyre, 2007; Hockett & Hall, 2007; Liu & Sibley, 2004; Marion & Reid, 2007; Widner & Roggenbuck, 2000).

Although there is a general preference among visitors and managers alike for informational approaches to managing visitor behavior in parks, previous research suggests that information and education are not always effective at persuading visitors to behave in a manner that minimizes their impacts to park resources and the quality of other visitors' experiences (Vande Kamp, Johnson, & Swearingen, 1994; Park et al., 2008). Such is the case at the 'Ohe'o Pools (referred to hereafter as "the pools"), a primary visitor attraction in the Kīpahulu area of Haleakalā National Park. Within the Kīpahulu area of the park, a formal trail leads visitors to the rim of 'Ohe'o Gulch in which the pools are located, and concrete steps descend from the trail into the gulch itself. While some visitors remain on the trail above the pools, most descend the stairs into the gulch. Many of these visitors venture further, leaving the landing at the base of the stairs to explore the pools by hopping from rock to rock along Palikea Stream, "bushwhacking" through vegetation on the steep sides of the gulch, wading through and swimming in the pools, and cliff-jumping into the water. Exploring and swimming in the pools has become a popular visitor activity, and is a centerpiece of many tourism brochures and related promotional materials circulated to island visitors. Exploring and swimming in the pools is a legal activity when the National Park Service (NPS) determines the stream level does not pose a threat to visitors' safety. However, the NPS discourages visitors from exploring and swimming in the pools for reasons related to visitor safety, public health, resource protection, Native Hawaiian cultural protection, and the quality and nature of visitors' experiences. The NPS relies exclusively on indirect management in the form of onsite signage designed to dissuade visitors from exploring the pools, except on days when the stream is closed to visitors due to unsafe water levels. In particular, the NPS employs signage and interpretive information in the visitor center and along trails that focus primarily on the dangers and safety hazards associated with entering and exploring the pools area. Despite the NPS's current informational campaign, a large number of visitors choose to explore and/or swim in the pools.

The purpose of this study is to improve the design of visitor education and information messages to enhance their efficacy as tools to minimize the number of visitors who explore the pools. Further, the study is designed to assess whether indirect management alone is sufficient to meet NPS management objectives with respect to visitor use of the pools, or if more direct forms of management are needed to supplement visitor education and information. To do this, the study uses the Theory of Planned Behavior (TPB) to examine the cognitive factors that influence visitors' decisions about whether or not to explore the pools. Additionally, the study uses an experimental approach to assess the relative efficacy of two persuasive messages designed to act upon and influence the cognitive factors that are hypothesized within TPB to "drive" visitor behavior. The following section of the paper reviews previous studies concerning the efficacy of visitor-use management through education and information. This is followed by a presentation of TPB, which provides the theoretical framework for the study. Results of the study are presented, and the paper concludes with a discussion of findings and their implications for research and management.

Previous Research on the Efficacy of Visitor Education and Information

Previous research suggests that the efficacy of visitor education and information depends on the characteristics and circumstances of informational messages, target resource impacts, recreation settings, and visitor experiences and behaviors to which they are applied. Informational messages whose content explains the depreciative consequences of specific recreation behaviors and discusses the reasons for management policies have been found to effectively capture visitors' attention, influence their behavior, and even enhance their experience, in some cases (Bullock & Lawson, 2007). In contrast, regulatory messages that do not include a rationale for rules and regulations can have a negative effect on visitor experiences and be less effective at persuading visitors to adopt desired behaviors. Further, messages that attribute impacts of recreation behaviors to visitors so they can identify with and reflect upon them have been found to be more effective at reducing depreciative behavior than those that only instruct visitors to refrain from engaging in specific behaviors (Bradford & McIntyre, 2007). Additionally, results from a study of National Association for Interpretation members suggest that interpretation professionals perceive visitor information that uses *prescriptive* messages emphasizing desired behaviors to be more effective than *proscriptive* messages that focus on discouraging undesirable behaviors (Winter, Sagarin, Rhoads, Barrett, & Cialdini, 2000).

For visitor education and information to be effective, targeted visitor experiences and behaviors must be of a nature that facilitates visitor exposure and receptiveness to persuasive messages (Park et al., 2008). Managerially undesirable recreation behaviors that are careless, unskilled or uninformed have potential for management with information that educates visitors about and connects them with their impacts (Roggenbuck, 1992). Recreation impacts to resources that are wantonly illegal, such as theft from cultural sites, or unavoidable, such as disposal of human waste, are unlikely to be influenced by informational tactics (Roggenbuck, 1992; Widner-Ward & Roggenbuck, 2003). Results of a study of off-trail hiking on the summit of Cadillac Mountain in Acadia National Park found that signage encouraging visitors to stay on trail, rather than hiking off-trail and trampling alpine vegetation, was ineffective (Park et al., 2008). The authors concluded that this result could be explained, in part, by the fact that site visits were brief and visitors, focused on the site's highly attractive and accessible setting, generally did not spend time

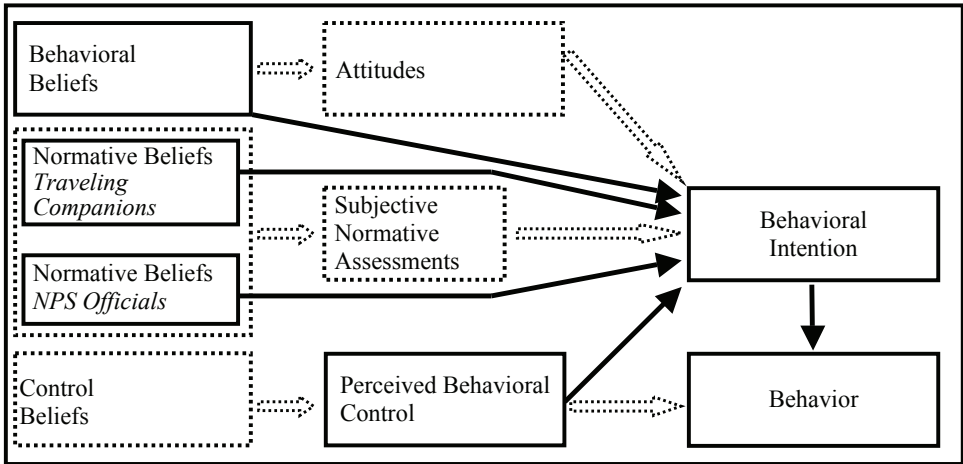
reading informational signs. Thus, the duration, pace, and focus of people's visits served to influence the efficacy of onsite signage.

Persuasive messages have been found to be most successful when they exploit the central route to persuasion as described by the Elaboration Likelihood Model of human behavior (Ham et al., 2008; Petty, McMichael, & Brannon, 1992). This route to persuasion is accessed when messages prompt individuals to consider the message's arguments, elaborate on the meaning of those arguments, and then respond by changing basic behavioral beliefs to align beliefs, attitudes, and behaviors with the message. Behavior changes via the central route to persuasion are may be deeper and more lasting than those achieved with peripheral route persuasion. Peripheral route persuasion relies on cues within the message and its delivery, including the credibility of the messenger and the number of arguments offered, to effect behavior change. This route to persuasion may result in behavior change, but change is often temporary and not reflective of actual change in underlying behavioral beliefs (Ham et al., 2008).

Findings from studies of the efficacy of visitor education and information suggest that theories of moral development can inform the design of persuasive messages based on the targeted audience and behaviors (Ham et al., 2008; Hockett & Hall, 2007; Marion & Reid, 2007; Park et al., 2008). Kohlberg (1976) and Gilligan (1982) developed spectra of moral development. These theories posit that individuals are motivated to behave by a diversity of interests and that these interests can be arranged in hierarchical spectrum along which one may progress throughout life. Within both theories, moral behavior is initially motivated by a primary concern for the self, then by concerns focused on others, and ultimately by justice, responsibility, and integration of caring for self and others. With respect to these spectra, persuasive messages emphasizing the dangers of or punishment for a behavior are directed toward individuals at lower orders of moral development, focusing on the negative effects of specific behaviors to the *self*. Messages presenting the negative effects of behavior to *communal* or *mutually valued* resources appeal to higher levels of moral development by encouraging behavior change for reasons of justice and equity. This review of literature suggests that there are a number of factors that influence the efficacy of visitor education and information tactics in achieving resource protection and visitor-use management objectives in national parks.

Theoretical Framework

TPB provides a theoretical framework that is potentially useful in understanding visitor behavior at the pools. Behaviors as understood within TPB are specific, spatially and temporally bounded, and volitional (Ajzen, 1991). This study defines its behavior of interest as *exploring the 'Ohe'o Pools in Haleakalā National Park*. The behavior *exploring* addresses the visitor activity of management concern to the NPS and can be understood as an explicit behavior by visitors. TPB posits that an individual's behavior is largely determined by one's intention to behave and one's perceived control over behaving in the intended manner. The theory further explains behavioral intention as the product of one's attitudes, subjective normative assessments, and perceived behavioral control (PBC). These constructs are themselves the product of behavioral, normative, and control beliefs, corresponding to attitudes, subjective norms, and PBC, respectively (Ajzen, 1991). Attitudes and their underlying behavioral beliefs are the rational assessments individuals make with respect to the behavior of interest. In this case, where the behavior of interest is exploring the pools, attitudes are visitors' own beliefs about



- Constructs and relationships of the TPB model operationalized in this study.
- Constructs and relationships of the Ajzen 1991 TPB model not operationalized in this study.

Figure 1: The Theory of Planned Behavior

and evaluations of potential outcomes of exploring the pools. Examples of such potential outcomes considered in this study are falling and getting hurt on rocks and having a true Hawaiian experience. Subjective normative assessments and their underlying normative beliefs are individual evaluations of the normative judgments of others. In this study, subjective normative assessments are visitors' perceptions of the extent to which others approve or disapprove of them exploring the pools, and the importance of others' approval of their behavioral decisions. PBC and its underlying control beliefs reflect individuals' perceptions of their ability and autonomy to engage in a behavior. At the pools, PBC addresses visitors' perceptions of their physical ability and autonomy to explore the pools.

This study applies Ajzen's (1991) TPB model with adaptations in construct measurement to better fit the behavior of interest, exploring the pools, and to more directly address the management interests of Haleakalā National Park. This operationalization varies from Ajzen's (1991) original TPB model in two substantive ways: 1) behavioral intention is hypothesized to be the sole predictor of behavior and; 2) behavioral and normative beliefs are used as measures of attitudes and subjective norms, respectively, rather than direct measures of the constructs themselves. The TPB model adapted and measured in this study positions behavioral intention as the product behavioral beliefs, normative beliefs, and perceptions of behavioral control (Figure 1).

Most visitors to the pools come with an expectation to explore—that is, with high perceptions of behavioral control over exploring (Lawson et al., 2008). Thus, PBC is not thought to be a barrier mitigating behavioral intention from being fulfilled. Subsequently, it is addressed only as an influence on behavioral intention in this

study's TPB model. This decision is supported by research. When investigating hunting intention and participation, Hrubec, Ajzen, and Daigle (2001), who found that PBC did not contribute directly to the prediction of behavior. Additional support is lent by Sutton (1998), who notes that behavioral variation explained by the combined influences of behavioral intention and PBC is similar to the behavioral variation explained when behavioral intention is modeled as a sole influence on behavior.

Ajzen's original TPB model is further adapted in this study's operationalization and measurement of attitudes and subjective norms through their constituent beliefs. That is, rather than measure attitudes and subjective normative assessments directly, this study measures behavioral and normative beliefs. Several studies have found that the informational foundation of behavioral and normative beliefs correlate highly with and directly form attitudes and subjective normative assessments (Armitage & Conner, 2001; Hrubec et al., 2001). In this study, behavioral belief measures are used in place of the attitude construct, and normative belief measures replace the subjective normative assessment constructs. To specifically address NPS management interests, two normative beliefs are included as influences on behavioral intention, one for study participants' traveling companions and one for NPS officials.

Several studies have applied TPB to model behavior in the context of outdoor recreation and natural resources management. Examples include the prediction of hunting behavior, participation in outdoor recreation activities, use of bear-resistant food storage canisters, and engagement in wild fire preparation and mitigation activities by private land owners (Ajzen & Driver, 1992; Bright & Burtz, 2006; Hrubec et al., 2001; Kouthouris & Spontis, 2005; Martin & McCurdy, 2009; Rossi & Armstrong, 1999). While previous TPB studies have used behavioral surrogates including reported past behavior as the dependent variable or "end point" of the TPB model, our study includes a measure of actual behavior, which allows us to examine the validity of stated behavioral intention as a precursor to actual behavior (Ajzen & Driver, 1992; Bright & Burtz, 2006; Hrubec et al., 2001).

Beyond prediction of behavior and behavioral intention, TPB has been used to examine the efficacy of visitor education and information. TPB posits that prior to engaging in a behavior, individuals form an intention to behave in a particular manner, and that this intention is constructed from cognitive assessments, or beliefs, with respect to the behavior (Ajzen, 1991). In identifying the relative salience (i.e., influence) of cognitive precursors to behavior, TPB can be used to target persuasive messages for maximal efficacy. Ham and others (2008) provide an extensive review and application of TPB to the evaluation of persuasive information campaigns for management of three depreciative behaviors in recreation settings: littering, wildlife feeding, and allowing dogs to run off-leash. Message interventions were examined using TPB analysis to isolate the most salient behavioral beliefs for decision-making, with respect to littering, wildlife feeding, and keeping dogs from running off-leash. Results were used to guide the design of information interventions to optimize their influence on visitor behavior.

In addition to testing potential persuasive messages, TPB has been used as a conceptual framework to evaluate existing programs of visitor education and management. Using TPB's positioning of behavioral beliefs as a foundational influence on behavioral intention, Lackey and Ham (2003) elicited salient behavioral beliefs from overnight campers in Yosemite National Park regarding bear-wise food storage. Salient beliefs identified in the study were compared to messages in current food storage

`Ohe`o Pools Area

The National Park Service discourages people from exploring the `Ohe`o Pools area because of the risk of injury or death. Falls on slippery rocks and from steep cliffs can result in serious injury to even the most sure-footed of visitors. Submerged rocks pose dangers to cliff jumpers and sudden flash floods have washed people to sea. A water-borne bacterial disease known to exist in the stream can cause rashes and more serious symptoms such as vomiting and diarrhea, which could lead to death. Please consider these potential health and safety issues when you decide whether or not to explore the `Ohe`o Pools area today.

Figure 2: Fear Treatment Message

informational campaigns, providing a basis for suggesting improvements in message design to target beliefs with the greatest potential to influence visitor behavior. TPB has also been used to evaluate the programs designed to promote the use of bear-resistant food canisters among backpackers in Yosemite Wilderness. Using TPB examine these visitors' intentions to use canisters, Martin and McCurdy (2009) measure intention to comply with food storage guidelines and identify attitudes and subjective normative assessments as the primary influences on behavioral intention.

As the TPB studies reviewed here illustrate, the progressive and quantifiable relationships among beliefs, intention, and behavior modeled by TPB provide a theoretical and empirical basis to evaluate and optimize the design of persuasive messages. This study builds on research reviewed by applying TPB to identify the salient cognitive precursors to visitor behavior at the pools and evaluate the relative influence of alternative messages on those cognitive factors. Thus, the study is designed to assess and enhance the efficacy of the NPS's visitor education efforts to influence visitors' behavior and achieve natural, cultural, and experiential resource protection objectives at the pools in Haleakalā National Park. In doing so, park managers can minimize the limitations of information-based visitor management (i.e., insufficient protection for intensive impacts at high-use, attraction-based sites) and maximize their benefits (i.e., increased visitor freedom and awareness of the effects of their behavior).

Treatment Messages

Two persuasive treatment messages were developed for evaluation within the TPB framework as potential informational management interventions at the pools. One message, designated the "fear message," states that the NPS discourages exploration of the pools because of visitor safety concerns, including dangers from flash floods, falling on slippery rocks, and bacterial pathogens in the water (Figure 2). The other message,

`Ohe`o Pools Area

The National Park Service discourages people from exploring the `Ohe`o Pools area because visitor use along the banks of the stream tramples native vegetation, and wading and swimming may harm rare native fish, shrimp, and snails that live in the stream. The often loud and large crowds also detract from the experience of those visitors who wish to appreciate the natural beauty of the area in a more quiet and peaceful way. These crowds can also diminish the area's value for traditional use by Native Hawaiians. Please consider these potential impacts to the natural resources and experiences of Native Hawaiians and park visitors when you decide whether or not to explore the `Ohe`o Pools area today.

Figure 3: Warm Glow Treatment Message

designated the “warm glow message,” states that the NPS discourages exploration because of resource protection concerns, including impacts to native flora and fauna, cultural resources, and visitors’ experiences (Figure 3). The messages were designed to target visitor behavioral beliefs as they are incorporated in this study’s TPB model by specifically addressing potential danger and resource impact related outcomes from exploring the pools that are believed by the NPS and the study’s researchers to be salient behavioral beliefs.

The messages were designed to incorporate elements of communications and moral development theory to maximize their effect in influencing visitor attitudes toward exploring the pools. As such, the messages prescribe desired behavior, explain why the prescribed behavior is desired, and address motivations for compliance at a variety of moral developmental levels (Marion & Reid, 2007; Petty et al., 1992; Winter et al., 2000). The persuasive messages are also designed to exploit the central route to persuasion as proposed by the Elaboration Likelihood Model (Petty et al., 1992). That is, the messages are intended to change behavior through visitor comprehension, self-attribution of consequences, and internalization of information, as opposed to the emphasis on message delivery associated with the peripheral route. The central route to persuasion is found to be effective and appropriate for delivering persuasive messages when targeting recreation behavior that is unintentionally depreciative, as exploring the pools is understood to be (Roggenbuck, 1992). While both messages are designed to address the same route to persuasion, they are targeted at different levels of moral development. The fear message is designed to address the lower levels of moral development, focusing on the potential negative outcomes of exploring for the individual visitor. The warm glow message is designed to address the higher orders of moral development, focusing on the potential of one’s actions to impact communal resources and the experiences of others.

Behavioral Beliefs $\sum b_i e_i$		My exploring the 'Ohe'o Pools area today would result in me...	
		Behavioral Belief Strength <i>b</i>	Outcome Evaluations <i>e</i>
		<i>not at all likely 1 → 7 extremely likely</i>	<i>extremely bad -3 → +3 extremely good</i>
	Danger	...getting caught in a flash flood	...getting caught in a flash flood
		...getting a rash	...getting a rash
		...falling on rocks and getting hurt	...falling on rocks and getting hurt
	Resource	...harming native plants and animals	...harming native plants and animals
		...reducing the area's value for native Hawaiians	...reducing the area's value for native Hawaiians
		...preventing others from experiencing the natural beauty of the 'Ohe'o Gulch	...preventing others from experiencing the natural beauty of the 'Ohe'o Gulch
	Experiential	...having a true Hawaiian experience	...having a true Hawaiian experience
...having a fun adventure		...having a fun adventure	
...having a story to tell when I get home		...having a story to tell when I get home	
	Normative Belief Strength <i>n</i>	Motivation to Comply <i>m</i>	
	<i>disapprove 1 → 7 approve</i>	<i>not at all important -3 → +3 extremely important</i>	
Normative Belief Traveling Companion <i>n_i m_i</i>	If I were to explore the 'Ohe'o Pools today, the people I am traveling with would...	How important is it to you that the people you are visiting the park with today approve of what you do?	
Normative Belief NPS Officials <i>n_i m_i</i>	If I were to explore the 'Ohe'o Pools today, National Park Service Officials would...	How important is it to you that National Park Service officials approve of what you do?	
Perceived Behavioral Control $\sum x_i / 3$	Control Beliefs <i>x</i>		
	Self-Efficacy <i>extremely difficult 1 → 7 extremely easy</i>		
	My physical ability would make exploring the 'Ohe'o Pools area today...		
	Controllability <i>strongly disagree 1 → 7 strongly agree</i>		
	It is entirely up to me and not National Park Service officials whether or not I explore the 'Ohe'o Pools area today.		
	It should be up to each visitor to evaluate how dangerous it is to explore the 'Ohe'o Pools area.		

Table 1: TPB Construct Composite Score Formation from Survey

Methods

TPB Implementation in the Survey

Behavioral, normative, and control beliefs, as well as visitors' behavioral intentions regarding exploration of the pools were measured using a survey administered to visitors prior to their visit to the pools. The survey was designed in a manner to capture multiple measures for each of the cognitive constructs (Ajzen, 2006). Individual measures for each construct within the survey were compiled into a set of five composite measures corresponding to: 1) behavioral beliefs, with respect to visitor safety, resource protection, and visitor experience outcomes; 2) normative beliefs, with respect to the NPS; 3) normative beliefs, with respect to traveling companions; 4) PBC; and 5) behavioral intention (Table 1).

This study's deductive measurement of behavioral and normative beliefs toward exploring requires identification of beliefs that are salient to the decision to explore. It is recommended that such beliefs are elicited from the study population through preliminary research (Ajzen, 2006; Francis et al., 2004). This study's remote location and resource constraints prevented eliciting salient behavioral or normative beliefs from the study population (i.e., park visitors) prior to developing questionnaire items. However, a systematic approach was used to identify beliefs thought to be salient to visitors at the pools. In particular, an informal survey was conducted among NPS officials and university scientists familiar with the study area and management issues associated with the pools. Participants were asked to list positive and negative outcomes they perceived visitors might associate with exploring the pools. Responses from NPS officials and university scientists were compiled and circulated to park managers and researchers for peer review and prioritizing. The result of this process was the set of behavioral and normative belief items included in the survey instrument.

The study's behavioral belief construct is a combination of behavioral belief strengths about and evaluations of potential outcomes from exploring the pools. Behavioral beliefs were measured as $\sum b_i e_i$, where b represents behavioral belief strength and e represents outcome evaluations (Francis et al., 2004). Questions designed to measure behavioral belief strength and outcome evaluations for nine potential outcomes were included in the survey. The nine potential outcomes address the visitor safety and health risks, resource and cultural impacts, and visitor experiences associated with exploring the pools. Danger outcomes from exploring include getting caught in a flash flood, contracting a rash, and falling and getting hurt on slippery rocks. Resource and cultural impact outcomes include harming native plants and animals, devaluing the area for traditional use by Native Hawaiians, and preventing others from enjoying the pools' natural quiet and beauty. Experiential outcomes of exploring include having a true Hawaiian experience, having a fun adventure, and having a story to tell when back at home. Behavioral belief strength, b , is an assessment of the likelihood of potential outcomes of exploring the pools and is measured in the survey instrument on a scale of 1, *not at all likely*, to 7, *extremely likely*. Outcome evaluations, e , are assessments of the *goodness* or *badness* of potential outcomes of exploring the pools and were measured on a scale of 1, *extremely bad*, to 7, *extremely good*. For analysis, outcome evaluations were recoded to -3, *extremely bad*, to +3, *extremely good* (Ajzen, 2006). The composite behavioral belief score for each respondent was calculated as $(\sum b_i e_i)/9$, and ranges in value from -21 to +21. Positive values indicate favorable attitudes toward exploring the pools, while negative values indicate unfavorable attitudes toward exploring.

In this study, normative beliefs with respect to of two referent groups were considered: 1) NPS officials, and 2) subject's traveling companions. Normative beliefs were measured as $\sum n_i m_i$ - where n is normative belief strength and m is motivation to comply (Francis et al., 2004). Normative belief strength, n , is an evaluation of the referent group attitude toward the behavior. Respondents were asked in two questionnaire items if they believed that their traveling companions or NPS officials would approve or disapprove of their exploring the pools. Each question was measured in the survey instrument on a scale from 1, *disapprove*, to 7, *approve*. For analysis, normative belief strength was recoded into a scale ranging from -3, *disapprove*, to +3, *approve* (Ajzen, 2006). Motivation to comply, m , is the importance of referent group approval of one's behavior. This was measured in the survey instrument by two

questions asking visitors to evaluate if the approval of traveling companions or NPS officials was 1, *not at all important*, to 7, *extremely important*, when making the decision to explore. The normative belief composite measure was computed as $\sum n_i m_p$, and ranges in value from -21 to +21. Positive values represent a perception that the corresponding referent group would approve of one's exploring the pools, while negative values represent a perception that the corresponding referent group would not approve of one's exploration of the pools. Respondents traveling alone were excluded from normative belief measures with respect to traveling companions.

PBC is the level of control an individual believes they have over engaging in a specific behavior. PBC is understood to include self-efficacy and controllability components (Ajzen, 1991). Self-efficacy is one's inherent ability to engage in a behavior (i.e., Are you able to perform the behavior?). Controllability is one's volitional power or locus of control over a behavior (i.e., Are you permitted to engage in the behavior?). In this study, the survey instrument was used to measure self-efficacy as respondents' perceived physical ease or difficulty of exploring the pools on a scale from 1, *extremely easy*, to 7, *extremely difficult*. Controllability was evaluated through two variables measuring visitor agreement with statements that visitors, and not NPS officials, should be responsible for deciding whether or not to explore and evaluating the danger of exploring on a scale ranging from 1, *strongly agree*, to 7, *strongly disagree*. For analysis, all PBC scores were reversed coded to a scale from 1, *strongly disagree*, to 7, *strongly agree*. Reverse-coded responses to each of the three PBC questions were averaged to provide an overall PBC score ranging from 1 to 7. High PBC scores (5 to 7) represent strong perceptions of control over to exploring the pools, and low values (1 to 3) represent a lack of perceived control with respect to exploring the pools.

In this study, behavioral intention was measured using two questions. In particular, visitors were asked to rate whether they *intended* to explore the pools on a scale from 1, *extremely unlikely*, to 7, *extremely likely*, and whether they *expected* to explore the pools on a scale ranging from 1, *strongly agree*, to 7, *strongly disagree* (Francis et al., 2004). For analysis, responses to the expectation measure were reverse-coded to a scale ranging from 1, *strongly disagree*, to 7, *strongly agree*. Responses from the intention and expectation measures were averaged to form a behavioral intention composite score ranging from 1 to 7—high values (5 to 7) represent intentions to explore, while low values (1 to 3) represent behavioral intentions to not explore. For some analyses, a binary behavior intention variable was formed from the behavioral intention composite scores. Values of 4.5 through 7 were recoded to 1 and treated as indicating intention to explore. Values 1 through 3.5 were recoded 0 and treated as an intention to *not* explore. Records with behavioral intention composite scores of 4 (the neutral point on the scale) were excluded from the behavioral intention binary variable, as they cannot be classified as either intending or not intending to explore the pools.

Sampling & Survey Administration

The survey instrument was administered on 15 randomly selected days between May 23 and July 13, 2007 to visitors at the start of their hikes on the trail to the pools, in the Kīpahulu area of Haleakalā National Park. Sampling was conducted between 9:00 a.m. and 4:00 p.m. All visitors on the trail to the pools over the age of 18 were eligible for participation in the study.

Respondents were recruited approximately 70 meters from the Kīpahulu area

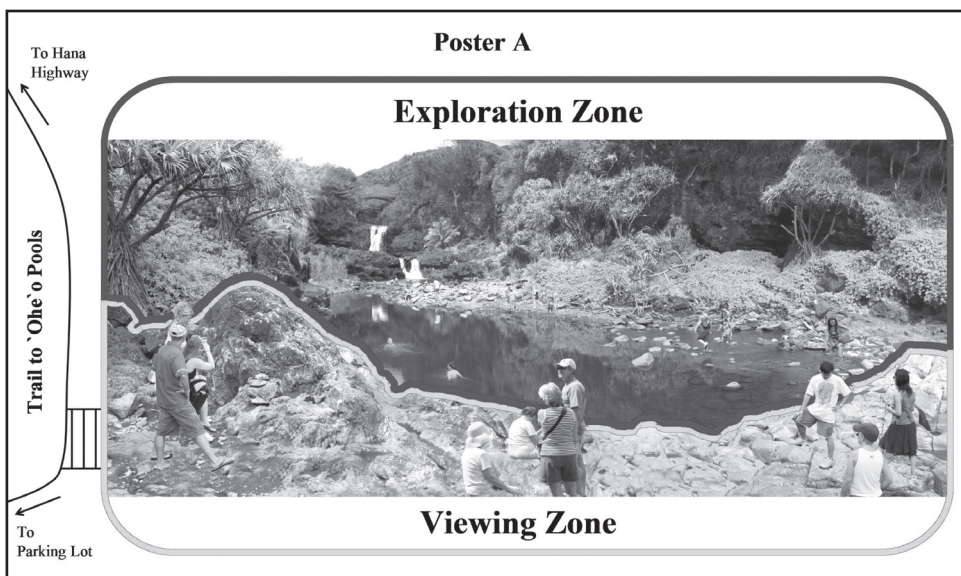


Figure 4: Exploration Zone Diagram

parking lot as they walked toward the pools along the main trail, prior to viewing most signs and on-site information about exploring the pools. Visitors who agreed to participate were shown a poster depicting the pools and read a description of the area and definition of *exploring* the pools that stressed a distinction between *viewing* and *exploring* the pools (Figure 4). *Viewing* the pools was described as going no further than the rock landing at the base of the stairs into `Ohe`o Gulch to view the pools. In contrast, *exploring* the pools was described as leaving the rocks at the base of the stairs to wade or swim in the water, or walk or climb on the shores and cliffs surrounding the pools. The distinction between viewing and exploring the pools was designed to establish a common understanding among respondents of the concept of *exploring* the pools before asking them to complete the questionnaire.

After receiving the description of exploring the pools, respondents were randomly assigned to one of three respondent groups: 1) a control group that received no message about exploring the pools; 2) a “fear” treatment group that was asked to read the fear message before answering questions in the survey designed to measure TPB constructs; or 3) a “warm glow” treatment group that was asked to read the warm glow message before answering questions in the survey designed to measure TPB constructs.

Behavioral Observation

Unobtrusive observation of visitor behavior at the pools was conducted in tandem with the visitor survey on a subset of sampling days. The purpose of the unobtrusive observations was to assess whether survey respondents’ actual behavior was consistent with their stated behavioral intentions, with respect to exploring the pools. Observations were conducted by researchers dressed in clothing similar to that worn by most visitors. Randomly selected survey respondents were unobtrusively followed to the pools area from the survey location. Upon crossing through the gate near the top of the stairs descending into the `Ohe`o

Gulch, selected respondents were observed for a maximum of 10 minutes. If the observed visitor entered the “exploration zone” of the ‘Ohe‘o Gulch (as depicted in Figure 4) within 10 minutes, they were designated as having explored the pools and the observation was concluded. If the observed visitor: 1) did not explore the pools within 10 minutes of having crossed through the gate at the top of the stairs; 2) did not cross through the gate within 25 minutes of having completed the questionnaire; or 3) left the pools area within 10 minutes or less without having explored the pools, the observation was concluded and the visitor was designated as having not explored the pools. Information characterizing the observed visitor’s group size, group composition, and clothing was also recorded to assist in matching observation and survey data. A binary variable was created for each observed respondent’s behavior, and assigned a value of 1 for *explorers* and a value of 0 for *non-explorers*. An additional variable, intention-behavior consistency, was created, and coded as 1 in cases where respondents’ observed behavior was consistent with stated behavioral intention, and 0 otherwise. The intention-behavior consistency variable was computed only for those survey respondents whose behavior was observed by the research team and had a behavioral intention composite score of 1 to 3.5 or 4.5 to 7. As with the binary behavior intention variable, the intention-behavior consistency variable was not computed for respondents with behavioral intention composite scores of 4 because this value represents the neutral point on the intention scale.

Data Analysis

Analyses of survey response and observation data were conducted to examine several hypotheses. The hypothesis tests were designed to assess the validity of the TPB model as a framework for understanding visitor behavior with respect to exploring the pools, and provide insight into the relative efficacy of the fear and warm glow messages in minimizing the number of visitors who choose to explore. Data analysis was conducted with SPSS 15.0 in a stepwise fashion, corresponding to the progression of hypothesized relationships within the TPB model as outlined here:

- H1: In comparison to the control group respondents, respondents who receive either the fear or warm glow persuasive message will have less favorable behavioral beliefs, normative beliefs, and PBC with respect to exploring the pools. ANOVA with Tukey’s HSD post-hoc tests were used to evaluate Hypothesis 1.
- H2: Visitors’ behavioral beliefs, normative beliefs, and PBC with respect to exploring are significant predictors of intention to explore the pools. Linear regression models were used to evaluate Hypothesis 2.
- H3: Exposure to either the fear or warm glow persuasive message will reduce visitors’ intentions to explore the pools. This hypothesis was examined with two statistical tests, ANOVA and Chi-square, both of which used respondent group (i.e., control, fear treatment, or warm glow treatment) as the independent variable. Behavioral intention served as the dependent variable for the ANOVA test, while the binary version of behavioral intention was the dependent variable for the Chi-square test.
- H4: Visitors’ stated behavioral intention with respect to exploring is a statistically significant predictor of actual exploring behavior. A Chi-square test was used to compare the intention-behavior consistency variable with stated behavioral intention.

H5: Exposure to either the fear or warm glow persuasive messages will reduce exploration behavior at the pools. A Chi-square test was used to compare observed behavior, by respondent group, to evaluate Hypothesis 5.

Results

Response Rates

Of the 1,635 individuals solicited to participate in the study, 997 (63.1%) agreed to do so. Usable surveys were obtained from 947 (95.3%) study participants, resulting in an effective response rate of 57.9%. Respondents were evenly distributed among respondent groups, with 315 (33.3%) in the control group, (33.3%), 316 (33.4%) in the fear treatment group, and 316 (33.4%) in the warm glow treatment group.

Visitor & Trip Characteristics

Most respondents (68.8%) spent two or more hours traveling to the Kīpahulu area of Haleakalā National Park on the day of their visit. Men and women are equally represented in the study (49.7% and 50.3%, respectively). A substantial majority of visitors to the pools were residents of the United States (92.7%); completed some college or more formal education (92.6%); did not consider themselves to be Hispanic or Latino (94.1%); and identified themselves as White (81.8%). Very few (1.4%) visitors to the pools identified themselves as Native Hawaiian. Thirty-one percent of respondents are between the ages of 25 and 54. When planning their visits, a minority of respondents (7.1%) used information from the NPS, while a majority of respondents (81.2%) used information from previous experiences, word-of-mouth sources, tourist activity outlets, and tourism brochures and guidebooks.

A series of statistical tests was performed to assess whether respondent group sub-samples differed significantly with respect to visitor and/or trip characteristics. The purpose of the tests was to confirm that differences found among respondent groups with respect to the study's hypothesis tests could not be attributed to differences in demographics and/or trip characteristics among the respondent groups. No significant differences were found among the three respondent groups with respect to commercial tour status ($\chi^2 = 1.840$, $p = 0.398$), previous vs. first-time visit ($\chi^2 = 4.495$, $p = 0.106$), time spent traveling to the park ($\chi^2 = 10.154$, $p = 0.254$), gender ($\chi^2 = 2.072$, $p = 0.355$), age ($\chi^2 = 9.746$, $p = 0.283$), and education ($\chi^2 = 4.143$, $p = 0.387$). These results support a high degree of confidence that differences among respondent groups with respect to results of the study's hypothesis tests are not the result of sampling bias.

TPB Model Analysis

The hypothesized influence of treatment messages on first level TPB model constructs (H1) is supported for behavioral and normative beliefs, but not PBC (Table 2). In particular, the control group had behavioral and normative beliefs that were statistically more favorable toward exploring than either group who received a persuasive message discouraging exploration. However, no statistical difference in the mean composite scores for PBC was found among respondent groups. Behavioral belief scores are statistically different among all groups. Those in the control group had the most favorable, and indeed positive, behavioral beliefs toward exploring the pools. Negative behavioral belief scores were measured for both treated groups. The warm glow message,

	Respondent Group Means			ANOVA	
	Control (n = 207)	Fear (n = 210)	Warm Glow (n = 203)	F-value	p-value
Behavioral Beliefs	0.487 _a	-0.739 _b	-1.856 _c	557.05*	<0.001
Normative Beliefs Traveling Companions	11.416 _a	4.780 _b	6.286 _b	4,727.90*	<0.001
Normative Beliefs NPS Officials	11.272 _a	-2.037 _b	-3.332 _b	26,057.29*	<0.001
Perceived Behavioral Control	4.471	4.669	4.540	4.21	0.266

NOTE: Within each row, means with different subscripts are statistically different ($\alpha = 0.05$).

Table 2: Persuasive Message Treatment Effects on TPB Constructs

Attitude <i>Potential Outcome from Exploring the Pools</i>		Control (n= 269-308)	Fear (n= 258-314)	Warm Glow (n= 254-316)	ANOVA	
		Mean	Mean	Mean	F-value	p-value
Danger	Getting caught in a flash flood					
	behavioral belief strength <i>b</i>	2.5	2.4	2.5	0.304	0.738
	outcome evaluation <i>e</i>	-2.2	-2.3	-2.3	0.806	0.447
	Getting a rash					
	<i>b</i>	3.1 _a	3.5 _b	3.4 _{a,b}	5.475*	0.004
	<i>e</i>	-1.7	-1.7	-1.7	0.018	0.982
Resource	Falling on rocks and getting hurt					
	<i>b</i>	3.6	3.5	3.8	2.904	0.055
	<i>e</i>	-1.9	-1.8	-2.0	1.236	0.291
	Harming native plants and animals					
	<i>b</i>	3.1 _a	3.4 _a	4.2 _b	27.825*	<0.001
	<i>e</i>	-1.9	-1.8	-1.9	0.463	0.629
Experiential	Reducing the area's value for native Hawaiians					
	<i>b</i>	3.2 _a	3.5 _a	4.0 _b	19.304*	<0.001
	<i>e</i>	-1.7	-1.6	-1.7	0.898	0.408
	Preventing others from experiencing the natural beauty of the 'Ohe'o Gulch					
	<i>b</i>	2.6 _a	3.0 _b	3.5 _c	22.878*	<0.001
	<i>e</i>	-1.6 _a	-1.2 _b	-1.6 _a	7.632*	0.001
Subjective Norm	Having a true Hawaiian experience					
	<i>b</i>	5.2 _a	4.7 _b	4.3 _c	17.879*	<0.001
	<i>e</i>	1.9 _a	1.5 _b	1.3 _b	10.297*	<0.001
	Having a fun adventure					
	<i>b</i>	5.9 _a	5.4 _b	5.3 _b	13.487*	<0.001
	<i>e</i>	2.1 _a	1.7 _b	1.5 _b	14.113*	<0.001
National Park Service Officials	Having a story to tell when I get home					
	<i>b</i>	5.6 _a	5.2 _b	5.0 _b	9.657*	<0.001
	<i>e</i>	1.7 _a	1.1 _b	1.1 _b	11.993*	<0.001
	Traveling Companions					
	normative belief strength <i>n</i>	2.4 _a	1.3 _b	1.4 _b	40.891*	<0.001
	motivation to comply <i>m</i>	4.7 _a	4.3 _b	4.6 _{a,b}	3.906*	0.020
Perceived Behavioral Control	National Park Service Officials					
	<i>n</i>	2.0 _a	0.4 _b	0.7 _b	176.993*	<0.001
	<i>m</i>	5.6 _a	4.8 _b	5.1 _b	18.981*	<0.001
	My physical ability would make exploring difficult/easy for me	6.0 _a	5.7 _b	5.9 _a	4.335*	0.013
	It is up to me, not NPS, to decide to explore...	3.9	3.9	4.3	3.287	0.038 [†]
	It is up to each visitor, not NPS, to evaluate dangers of exploring...	3.8	3.7	4.1	2.298	0.101
Behavioral Intention	I intend to explore the pools	5.8 _a	4.7 _b	4.6 _b	32.387*	<0.001
	I expect to explore the pools	5.9 _a	5.0 _b	4.9 _b	27.052*	<0.001

NOTE: Within each row, subscripts denote statistically different means ($\chi = 0.05$).

Table 3. Comparison of TPB Survey Items, by Respondent Group

	Treatment		
	Control	Fear	Warm Glow
Constant	4.002* (0.369)	3.389** (0.362)	3.378*** (0.407)
Attitude	0.135* (0.030)	0.212** (0.029)	0.284*** (0.026)
Subjective Norm Traveling Companion	0.237** (0.012)	0.459** (0.010)	0.409*** (0.010)
Subjective Norm NPS Officials	0.208** (0.010)	0.188** (0.009)	0.150** (0.008)
Perceived Behavioral Control	0.215** (0.070)	0.188** (0.074)	0.175** (0.081)
r²	0.263	0.575	0.553

* 0.05 > p-value ≥ 0.01; ** 0.01 > p-value ≥ 0.001; *** p-value < 0.001

Table 4: Regression Model Coefficients for Prediction of Behavioral Intention from TPB Constructs (Standard Errors in Parentheses)

	N	Control	Fear and Warm Glow Groups Combined	χ ²	p
Intend to Explore	825	89.7%	68.8%	44.34	< 0.001
Observed Exploring	134	59.1%	40.0%	4.33	0.03

Table 5: Persuasive Message Treatment Effects on Intention to Explore and Actual Exploring

emphasizing the resource and experiential impacts of exploring the pools, resulted in less favorable behavioral beliefs than the fear message, which focused on dangers and safety issues associated with exploring. All respondent groups generally believed that their traveling companions would approve of them if they explored the pools. However, respondents who received persuasive messages discouraging exploration of the pools were less certain than control group respondents that their traveling companions would approve of them exploring. Differences between control and treatment groups, with respect to normative beliefs in reference to NPS officials, were more pronounced. In particular, control group respondents believed NPS officials would approve of them if they explored the pools, while treatment group respondents generally believed NPS officials would not approve of them exploring the pools. However, normative belief strength scores for the two treatment groups were near the center of the measurement scale, suggesting uncertainty among treatment group respondents about NPS officials’ approval of exploring (Table 3). There was no statistical difference between the two treatment groups with respect to subjective normative assessments for traveling companions or NPS officials.

Results of regression analyses to examine H2 suggest that, for all respondent

groups, behavioral beliefs, normative beliefs, and PBC were significant, positively related predictors of behavioral intention (Table 4). That is, respondents with more favorable behavioral beliefs toward exploring, greater perceptions that traveling companions and NPS officials approve of their exploring, and stronger senses of personal control over exploring were more likely to state intentions to explore the pools. More of the variation in behavioral intention was explained for groups that received a persuasive message than for the control group. Within each regression model, traveling companion normative beliefs were the strongest predictor of behavioral intention.

Respondents who were exposed to either the fear or warm glow treatment messages were significantly less likely than control group respondents to report an intention to explore, thus supporting H3 (Table 5). However, there is no statistical or substantive difference between the behavioral intentions of either treated message group using Tukey's post hoc test (Means: control = 5.895, fear = 4.854, warm glow = 4.739; $F = 36.847, p < 0.001$). The fourth hypothesis (H4) posited behavioral intention as a predictor of actual behavior. Relatively low numbers of behavioral observations prevent tests of this hypothesis from being conducted by respondent group. Of all survey respondents who were observed by the research team, close to two-thirds (60.3%) behaved in a manner consistent with their behavioral intention, as stated in their responses to the survey questions. Respondents who indicated in the survey that they did not intend to explore the pools acted more consistently than those who intended to explore—87.0% of “non-intenders” acted consistently, while 53.8% of “intenders” acted consistently by actually exploring the pools during the observation period. The hypothesized effect of treatment message on actual behavior (H5) was supported by the higher proportion of control group respondents observed exploring the pools (59.1%), compared to the proportion of treatment group respondents who were observed exploring (40.0%; Table 5).

Discussion

Visitor education and information are generally preferred tools for managing visitor use in national parks, however, their acceptability to managers and visitors alike depend on their effectiveness at protecting park resources and visitors' experiences. This study illustrates the use of TPB as a tool to assess and improve the efficacy of visitor education and information through an empirical understanding of visitor behavior and its cognitive precursors, and the influence of persuasive messages on them. The results of the study have implications for the validity of TPB as a model of human behavior and the efficacy of visitor education and information as tools to manage visitor use at the pools in Haleakalā National Park and other similar protected natural areas contexts.

TPB proves to be a useful model for understanding visitor behavior at the pools and for evaluating the efficacy of persuasive messages designed to discourage visitors from exploring the pools. In general, hypothesized relationships among constructs within the TPB model were supported: behavioral beliefs, normative beliefs, and PBC shape behavioral intention; behavioral intention predicts behavior; behavior and the cognitive factors that shape behavior were influenced with persuasive messages. More specifically, the study results suggest that visitors' normative beliefs with respect to traveling companions were the strongest predictor of intention to explore the pools, across control and treatment respondent groups. The results also suggest visitors' behavioral beliefs regarding exploration of the pools were a markedly more robust

predictor of behavioral intention among warm glow treatment group respondents than either the fear treatment or control respondent groups. These findings are somewhat in conflict with the findings of other studies using TPB to understand outdoor recreation and wildland behaviors. Studies of participation in hunting, outdoor leisure activities, and adoption of wild fire mitigation strategies by wildland-urban interface homeowners have concluded that PBC and attitudes are the greatest predictors of behavioral intentions, and that normative assessments are of lesser importance (Ajzen & Driver, 1992; Burtz & Bright, 2006; Hrubec et al., 2001; Martin & McCurdy, 2009). It may be that the use of specific referent groups in this study to elicit normative beliefs increased the relevance of this cognitive factor in shaping behavioral intention. Additionally, and excepting the finding of Martin and McCurdy (2009), other TPB studies referenced examined behavioral intentions for activities occurring in and around the communities where respondents live. Most visitors to the pools were there as part of vacations and were a long distance from home (Lawson et al., 2007). Visitors may use a different balance of cognitive assessments when making decisions regarding their behavior while on vacation in distant places than they do within their communities. Although the relative contribution of TPB constructs found in this study differs somewhat from applications of TPB to presumably similar contexts, the study model's power to predict variation in behavioral intention (26.3% control, 57.5% fear, 55.3% warm glow) compares favorably with the findings of a meta-analytic review of 185 TPB studies published before 1997 (mean = 39%; Armitage & Conner, 2001). Using Cohen's guidelines for calculating effects sizes, the predictions of behavioral intention found in this study can be interpreted as being of large effect size (Cohen, 1992).

The results of this study point to the cognitive factors that influence the behaviors of two populations of park visitors: 1) current visitors to the park, whose decisions about whether or not to explore the pools were based solely on the information they gathered prior to arriving onsite (i.e., control group respondents); and 2) potential future visitors, represented by the fear and warm glow treatment groups, whose pre-trip planning information is supplemented with onsite information they receive from the NPS designed to discourage exploration of the pools. Results of this study suggest that current visitors, as represented by the control group respondents, arrive at the park with the impression that exploring the pools is a desirable and sanctioned way to experience the Kīpahulu area of the park. They have favorable behavioral beliefs about exploring, believe that both the NPS and their traveling companions support exploring, believe that it is within their power and ability to explore, and generally intend to explore the pools during their visit. Upon arriving at the pools, most visitors who received no message discouraging exploration did indeed explore. When making the decision to explore with only currently available off-site information, results of regression analysis suggest visitors relied equally on perceptions of behavioral control and normative beliefs with respect to traveling companions and the NPS, all of which were judged to support decisions to explore. Context to help explain these findings is provided by the results of a separate survey conducted in the Kīpahulu area of the park in tandem with this study's survey. Results of the companion study suggest that the vast majority of current visitors planned their visit to the park based on information they obtained through guidebooks, word of mouth, and tourism brochures (Lawson et al., 2007). These information sources emphasize the appeal of exploring the pools as a primary reason for visiting the Kīpahulu area of the park, and they do not discuss the NPS's efforts to discourage

visitors from exploring the pools or the reasons why they have adopted such a policy.

Visitors exposed to either treatment message had less favorable behavioral beliefs about exploring the pools than control group respondents. This finding suggests that the persuasive messages modified visitors' rational assessments of the personal and social costs and benefits of exploring the pools. Additionally, treatment group respondents, who were specifically informed that the NPS discourages exploring the pools, were less likely than control group respondents to believe the NPS would approve of them exploring. Consequently, treatment group respondents were less likely to express an intention to explore and actually explored less than control group respondents. In this general sense, the results of the study suggest that visitor education and information can be an effective approach for reducing the number of visitors who choose to explore the pools. However, like the control group, treatment group respondents believed that their traveling companions would support a decision to explore and that exploring was within their power. Furthermore, although treatment group respondents' cognitive assessments were generally less favorable toward exploring than those of the control group, more than two-thirds (68.8%) indicated that they intended to explore the pools (though less than half—40.0%—actually did). These results suggest that even with exposure to persuasive messages like those used in this study, a substantial proportion of visitors will choose to explore the pools. This may be due, in part, to visitors' reliance on normative assessments with respect to traveling companions when deciding to explore, as illustrated by results from this study's regression analyses. For both treatment groups, visitors' traveling companions were judged to support exploring and these judgments contributed greatest to prediction of behavioral intention. The perception that traveling companions support exploring was perhaps an artifact of the generally pro-exploring information visitors used to plan their trips and form expectations of their visit.

Differences in the cognitive precursors of behavior, and in exploration behavior itself, are observed between control group respondents and those who received a treatment message. These differences support the use of visitor education and information as at least part of the strategy for dissuading visitors from exploring the pools. Study findings also provide a basis for evaluating the relative effectiveness of an education approach aimed at public health and visitor safety considerations, versus an approach focused on resource stewardship and protecting the quality of visitors' experiences. Results of the study's hypothesis testing suggest that the warm glow message may be more effective than the fear appeal at discouraging exploration of the pools. Visitor rational assessments, as measured in this study by behavioral beliefs, were influenced to a greater degree by the warm glow appeal than by the fear appeal. This is reflected in the differences between treatment and control group behavioral belief measures for each potential outcome assessed (Table 3). The mean scores for the three potential outcomes specifically addressed by the warm glow message (i.e., harming native plants and animals, reducing the area's value for native Hawaiians, and preventing others from experiencing the natural beauty of the 'Ohe'o Gulch) were all significantly lower for the warm glow treatment group than the control and fear groups. That is, visitors who received the warm glow treatment message internalized the resource, experiential, and cultural impacts emphasized and consequently believed more strongly than the other respondent groups that their exploring would cause such impacts. A similar effect was not seen for the fear message, which was designed to emphasize the public health and visitor safety risks associated with exploring the pools. Within the

fear treatment group results, only one mean score of the three behavioral beliefs for potential outcomes specifically addressed by the fear message was lower than that of the control group. The fear message did not prompt overall change in most of the behavioral beliefs it was designed to influence. These findings suggest that visitors' attitudes regarding exploration of the pools are more effectively influenced by appealing to a sense of resource stewardship and social responsibility than to fears about the potential dangers of exploring the pools. Further, the results of this study suggest that warm glow treatment group respondents' behavioral intentions were shaped to a larger degree than those of either of the other two respondent groups by their attitudes about exploring the pools. These findings are particularly noteworthy, given that virtually all of the onsite information provided by the NPS to visitors concerning the pools is designed to emphasize the public health and visitor safety risks associated with exploring the pools. The results of this study suggest that re-focusing onsite information provided to visitors to emphasize themes contained in the warm glow message may allow the NPS to more effectively exploit the central persuasion route to capitalize on lasting and fundamental behavior change at the pools.

The warm glow message's greater influence than the fear message in reducing impactful visitor behavior at the pools is consistent with conclusions from a study in Acadia National Park in which visitors remained on trails for reasons of social altruism and justice associated with higher levels of moral development (Park et al., 2008). The warm glow message was written to stimulate just such cognitive processing. This study's findings also align with those of anti-littering and other pro-environmental behavior reviewed and investigated by Ham et al. (2008). However, fear messages appealing to more individualistic motivations that can be classified within lower orders of moral development have been found to be more effective at reducing wildlife feeding in recreation settings (Hockett & Hall, 2007). Thus, the results from this and similar studies are mixed with respect to the relative efficacy of persuasive messages appealing to higher or lower orders of moral development, suggesting that message efficacy is context-sensitive. The results of this study provide an empirical basis to support an approach that targets higher orders of moral development in the case of exploring the pools in Haleakalā National Park.

Results of this study with respect to visitors' normative assessments of NPS officials add further insight into how visitors' decisions to explore can be more effectively influenced through improved message design. The control group's normative belief strength with respect to NPS officials suggests that current visitors to the pools generally believe the NPS approves of them exploring the pools. This is presumed to be a result of the prevalence of pro-exploration information contained in guidebooks and tourism brochures used by visitors to plan their trips. When treatment group respondents, after having established pro-exploration expectations for the pools, are exposed to messages explicitly stating that the NPS discourages exploring, they are uncertain whether or not the NPS approves of visitors exploring the pools. Evidence of this confusion is found in mean normative belief strength scores for treatment group respondents near the neutral point of the measurement scale. Comparison of the treatment groups' near neutral normative belief scores to their relatively high motivation to comply scores, suggests that the uncertainty induced by expectation-message conflict constitutes a missed opportunity to use informational messages that leverage visitors' desire to comply. These findings are significant in light of the fact that none of the onsite

signage at the time of the study explicitly stated that the NPS discourages visitors from exploring the pools. Our study suggests that using messages that explicitly state the NPS discourages exploring the pools would be a relatively easy and effective improvement to current efforts. These results also suggest that it is important for the NPS to contribute, to the extent possible, to the design and content of messages contained in the primary information sources visitors use to plan their trips prior to arriving at the park. This, coupled with increased efforts to direct visitors to the park's official media for trip planning, is a key element of a strategy to inform visitors' expectations and begin to shape their behavior in advance of their arrival onsite.

Efforts to improve visitor education and information about exploring the pools, as described here, should be implemented within the framework of adaptive management. That is, changes to the NPS's visitor education and information strategies should be accompanied with monitoring to assess the extent to which such changes are effective at reducing the actual number of visitors who explore the pools and the associated resource, cultural, and experiential impacts of concern. If monitoring results suggest continued problems, this would imply the need to supplement or replace visitor education and information with more direct forms of management. Such efforts might include requiring visitors to venture no further than the rock landing at the base of the stairs into 'Ohe'o Gulch, or closing the stairs into the gulch and only allowing visitors to view the pools from the trail above the gulch. These more direct management approaches are likely to be less popular with visitors than the current use of visitor education, require costly changes to park infrastructure, and depend on the presence of park staff to enforce closure of the pools. Thus, it would be advisable to adopt such strategies only if improvements to visitor education and information like those describe above fail to produce the results required to adequately protect park resources and the quality of visitors' experiences. Further, if more direct management strategies are ultimately adopted, it is recommended that they be coupled with increased information, both onsite and in information sources used by visitors to plan their trips, about other recreation opportunities in the Kipahulu area of Haleakalā National Park.

While the results of this study provide an empirical basis for supporting visitor education and information strategies to manage exploration of the pools, the study has limitations that should be noted. Research on persuasive communications to manage visitor impacts in parks suggests the effectiveness of such visitor information may be further enhanced, beyond that of the messages tested in this study, by fully incorporating principles of attribution and prescription (Bradford & McIntyre, 2007; Winter et al., 2000). Messages tested in this study included an explicit statement discouraging exploring and describing the undesirable consequences of that behavior. Their content, particularly the absence of language personally attributing those consequences to individual visitors and description of alternative desired behaviors, can be seen as a limitation to their effectiveness. Future tests of persuasive messaging for management of park visitors should more fully integrate attribution and prescription in message design.

Another potential limitation of this study arises from the fact that survey administrators did not systematically control whether or not traveling companions accompanied respondents while they were participating in the study or whether or not the companions were exposed to the treatment messages. Thus, normative assessments made by respondents in the company of normative referents (i.e., their

traveling companions) may be systematically different than those made by respondents whose traveling companions were not with them when they were exposed to treatment messages and/or completed the questionnaire. While these unaccounted for interactions may influence normative assessments and behavioral decision-making, normative beliefs with respect to traveling companions have consistent and powerful positive influence on exploration. Further, the circumstantial, rather than systematic manner in which traveling companions did or did not accompany respondents during treatment message and survey administration is arguably similar to the manner in which visitors do or do not read onsite signage in the company of their traveling companions.

In addition to the above limitations, the potential influence of existing on-site signage on visitor perceptions and behaviors should be discussed. Prior to completing this study's questionnaire, visitors had the opportunity to encounter only a limited amount of signage presenting either danger or resource protection messages focused on exploring the pools. Thus, the potential for onsite signage to have influenced TPB construct measurement is limited. However, following survey completion but before arriving at the pools, respondents did have the opportunity to encounter many signs communicating information about exploring the pools. This information was exclusively danger related with no discussion of potential resource impacts from exploring. While this signage may have influenced respondents, it would have only effected measurement of observed behavior. This potential influence can not be tested with data from the current study. Although the influence of onsite signage on observed behavior can not be tested here, the statistically significant and substantial differences between rates of exploration for the control and the combined message treated groups indicates that the treatment messages did indeed reduce exploration behavior at the pools.

Conclusion

In summary, results of this study suggest TPB provides a valid model of visitor behavior at the pools and a useful framework for assessing the efficacy of persuasive messages designed to influence visitors' choices about whether or not to explore the pools. Further, the study findings support several recommendations regarding the NPS' use of visitor education and information to dissuade visitors from exploring the pools. In particular, the results of this study suggest the NPS should re-focus information delivered to visitors through onsite signage and park staff to emphasize themes associated with the warm glow message. That is, the information provided to visitors onsite at the time of the study emphasizing the public health and visitor safety risks of exploring the pools should be supplemented, if not largely replaced, with messages that emphasize the resource, cultural, and experiential consequences of visitors exploring the pools. Further, communication with visitors about the pools should be designed to explicitly inform them that exploring the pools is discouraged by the NPS.

References

- Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, 50, 179–211.
- Ajzen, I. (2006). *Constructing a TPB questionnaire: Conceptual and methodological considerations*. Retrieved May 26, 2008, from University of Massachusetts, Icek Ajzen Theory of Planned Behavior Web Site: <http://people.umass.edu/ajzen/tpb.html>.

- Ajzen, I., & Driver, B. (1992). Application of the theory of planned behavior to leisure choice. *Journal of Leisure Research, 24*, 207–224.
- Armitage, C. J., & Conner, M. (2001). Efficacy of the theory of planned behavior: A meta-analytic review. *British Journal of social Psychology, 40*, 471–499.
- Bradford, L. E. A., & McIntyre, N. (2007). Off the beaten track: Messages as a means of reducing social trail use at St. Lawrence Islands National Park. *Journal of Park and Recreation Administration, 25*, 1–21.
- Bright, A. D., & Burtz, R. T. (2006). Firewise activities of full-time versus seasonal residents in the wildland-urban interface. *Journal of Forestry, 106*, 307–315.
- Bullock, S. D., & Lawson, S. R. (2007). Managing the “commons” on Cadillac Mountain: A stated choice analysis of Acadia National Park visitor preferences. *Leisure Science, 30*, 71–86.
- Bullock, S. D., & Lawson, S. R. (2008). Examining the potential effects of management actions on visitor experiences on the summit of Cadillac Mountain, Acadia National Park. *Research in Human Ecology, 14*, 140–156.
- Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*, 155–159.
- Gilligan, C. (1982). *In a different voice: A psychological theory and women’s development*. Cambridge, MA: Harvard University Press.
- Ham, S., Weiler, B., Hughes, M., Brown, T., Curtis, J., & Poll, M. (2008). *Asking visitors to help: Research to guide strategic communication for protected area management* (Project #80039). Queensland, Australia: Griffith University, Sustainable Tourism Cooperative Research Center.
- Hendee, J. C., & Dawson, C. P. (2002). Wilderness visitor management: Stewardship for quality experiences. In Hendee, J.C., & Dawson, C.P., *Wilderness Management: Stewardship and Protection for Resources and Values* (pp. 461–503). Golden, CO: Fulcrum Publishing.
- Hockett, K. S., & Hall, T. E. (2007). The effect of moral and fear appeals on park visitors’ beliefs about feeding wildlife. *Journal of Interpretation Research, 12*, 5–27.
- Hrubes, D., Ajzen, I., & Daigle, J. (2001). Predicting hunting intentions and behavior: An application of the theory of planned behavior. *Leisure Science, 23*, 165–178.
- Kohlberg, L. (1976). *Moral development and behavior: Theory, research and social issues*. New York: Holt, Rinehart and Winston.
- Kouthouris, C., & Spontis, A. (2005). Outdoor recreation participation: An application of the theory of planned behavior. *The Sport Journal, 8*. Retrieved May 26, 2008 from <http://thesportjournal.org/article/outdoor-recreation-participation-application-theory-planned-behavior>.
- Lackey, B. K., and Ham, S. H. (2003). Contextual analysis of interpretation focused on human-black bear conflicts in Yosemite National Park. *Applied Environmental Education and Communication, 2*, 11–21.

- Lawson, S. R., Hockett, K., Kiser, B. C., Reigner, N. R., Ingram, A., Barnes, C., Dymond, S.F. (2008). *Research to support visitor use management and resource protection at the `Ohe`o Pools in Haleakalā National Park: Final report*. Virginia Polytechnic Institute and State University, Department of Forestry.
- Lawson, S. R., Kiser, B. C., Hockett, K., Reigner, N. R., Howard, J., and Dymond, S. F. (2007). *Social science research to support visitor experience and resource protection (VERP) planning in Haleakalā National Park*. Virginia Polytechnic Institute and State University, Department of Forestry.
- Liu, J.H., & Sibley, C.G. (2004). Attitudes and behavior in social space: Public good interventions based on shared representations and environmental influences. *Journal of Environmental Psychology, 2*, 373–384.
- Manning, R. E. (1999). *Studies in outdoor recreation: Search and research for satisfaction* (2nd ed.). Corvallis: Oregon State University Press.
- Marion, J. L., & Reid, S. E. (2007). Minimizing visitor impacts to protected areas: The efficacy of low impact education programs. *Journal of Sustainable Tourism, 15*, 5–26.
- Martin, S. R., Marsolais, J., & Rolloff, D. (2009). Visitor perceptions of appropriate management actions across the recreation opportunity spectrum. *Journal of Park and Recreation Administration, 27*, 56–69.
- Martin, S. R., & McCurdy, K. (2009). Wilderness Food Storage in Yosemite: Using the Theory of Planned Behavior to Understand Backpacker Canister Use. *Human Dimensions of Wildlife, 14*, 206–218.
- Park, L. O., Manning, R. E., Marion, J. L., Lawson, S. R., Jacobi, C. (2008). Managing visitor impacts in parks: A multi-method study of the effectiveness of alternative management practices. *Journal of Park and Recreation Administration, 26*, 97–121.
- Petty, R. E., McMichael, S., & Brannon, L. (1992). The elaboration likelihood model of persuasion: Application in recreation and tourism. In M. J. Manfredo (Ed.), *Influencing Human Behavior: Theory and Applications in Recreation, Tourism, and Natural Resources Management* (pp. 77–102). Champaign, IL: Sagamore Publishing Inc.
- Roggenbuck, J. W. (1992). Use of persuasion to reduce resource impacts and visitor conflicts. In M. J. Manfredo (Ed.), *Influencing Human Behavior: Theory and Applications in Recreation, Tourism, and Natural Resources Management* (pp. 149–208). Champaign, IL: Sagamore Publishing Inc.
- Rossi, A. N., & Armstrong, J. B. (1999). Theory of reasoned action vs. theory of planned behavior: Testing the suitability and sufficiency of a popular behavioral model using hunting intentions. *Human Dimensions of Wildlife, 4*, 40–56.
- Sutton, S. (1998). Predicting and explaining intentions and behavior: How well are we doing?. *Journal of Applied Social Psychology, 28*, 1317–1338.
- Vande Kamp, M. E., Johnson, D. R., & Swearingen, T. C. (1994). *Deterring minor acts of noncompliance: A literature review* (Tech. Rep. NPS/PNRUW/NRTR-92/08). Seattle, WA: University of Washington, College of Forest Resources, Cooperative Park Studies Unit.

- Vistad, O. I. (2003). Experience and management of recreation impacts on the ground: A study among visitors and managers. *Journal for Nature Conservation, 11*, 363–369.
- Widner, C. J., & Roggenbuck, J. (2000). Reducing theft of petrified wood at petrified forest national park. *Journal of Interpretation Research, 5*, 1–18.
- Widner-Ward, C. J., & Roggenbuck, J. (2003). Understanding park visitors' responses to interventions to reduce petrified wood theft. *Journal of Interpretation Research, 8*, 67–82.
- Winter, P. L., Sagarin, B. J., Rhoads, K., Barrett, D. W., & Caildini, R. B. (2000). Choosing to encourage or discourage: Perceived effectiveness of prescriptive versus proscriptive messages. *Environmental Management, 26*, 589-594.