

**The Effectiveness of Two Interventions on Reducing Deer
Feeding Behavior by Park Visitors**

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Thesis submitted to the Faculty of the
Virginia Polytechnic Institute and State University
in partial fulfillment of the requirements for the degree of

Master of Science
in
Forestry

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February 21, 2000
Blacksburg, Virginia

Keywords: Human/wildlife Interactions, Interventions, Moral Appeal, Fear Appeal

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(ABSTRACT)

Seeing wildlife in our Nation's parks is often a highlight of many visitors' trips, but close range human - wildlife interactions can have negative consequences for both wildlife and people. The purpose of this study was to evaluate the effectiveness of two interventions (fear and moral appeals) designed to reduce the feeding of deer by visitors in Shenandoah National Park by measuring changes in visitor attitudes and behavior. The study was conducted from July - September 1999 in a campground and picnic area, by placing the interventions (a small sign) on all picnic tables. Visitor attitudes and beliefs about the different components of the fear and moral appeal interventions were assessed by conducting surveys of campers under each experimental condition (control, moral appeal, and fear appeal). The impact of the interventions on behavior was tested in the picnic area by observing the responses of visitors to deer that frequently begged for food.

Under current Park intervention conditions, visitors generally believe that feeding deer is not healthy for the deer. They have considerably less knowledge about potential threats to themselves from feeding deer. The fear appeal significantly changed attitudes about the risks to people (ANOVA, $p=0.001$). Under control conditions the majority (63%) of groups picnicking fed deer. Although the fear appeal produced an attitude change, it did not reduce feeding behavior by visitors (39% fed) as much as the moral appeal did (25% fed). The conflicting results between attitude and behavior change strongly suggest that researchers need to measure behavior and not just attitudes.

ACKNOWLEDGEMENTS

I would like to thank my thesis advisor, Troy Hall, and my committee members, Bruce Hull and Joe Roggenbuck for their help and advice throughout this research project. I would also like to thank Shenandoah National Park for their permission to conduct this research and for providing me a campsite while I was in the Park. I would especially like to thank my family and friends for their encouragement and support.

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INTRODUCTION

Problem statement

An important part of many visitors' experience in natural public land areas is viewing wildlife. Although seeing wildlife can be a profoundly positive experience for the recreationist, some interactions with wildlife, such as trying to feed them, may have negative consequences for the visitor as well as the animal. Wildlife feeding is a difficult and serious issue for agency managers who want their visitors to have positive and meaningful experiences with nature. However, they need to balance the potential benefits to the recreationist of getting close to and feeding wildlife with agency mandates to protect both wildlife and people from the negative consequences of human-wildlife interactions.

Despite attempts to educate visitors not to feed wildlife and even using threats of fines, a considerable problem still exists in many parks with visitors feeding animals ranging from ducks to bears. This suggests that current intervention strategies are not effective in changing the behavior of visitors who feed wildlife. It is also not known which of the current interventions is most effective in reducing wildlife feeding. The purpose of this study is to evaluate the effectiveness of two interventions designed to reduce the feeding of deer by visitors in Shenandoah National Park (SNP), by measuring changes in visitor attitudes and behavior.

Hazards of feeding wildlife

Humans can be seriously injured while feeding wildlife. Although most visitors recognize that bears, which are large and have sharp teeth and claws, may be hazardous, it is not widely believed that seemingly peaceful creatures such as deer could be potentially dangerous to people (Bryan and Jansson 1973). A startled deer could severely injure a person who gets too close to it by kicking or goring the person with its antlers (Pollick 1999).

Eventually all visitors, even ones who do not seek a close encounter with wildlife, could be at risk for injury because deer and other wildlife accustomed to

receiving handouts can become aggressive in their attempts to panhandle for food. In the Grand Canyon, mule deer (*Odocoileus hemionus*) began striking visitors with their forefeet and butting them with their antlers in attempts to solicit food (Leslie 1995). In addition to immediate physical injuries from wildlife, many animals also carry diseases (e.g., rabies) or disease vectors (e.g., fleas and deer ticks), which may be transmitted to humans from bites or simply from close physical contact.

Wildlife may also suffer significant negative consequences when they are fed by visitors. One problem is that most of the food handouts are not suitable for the animals' digestive systems. Although deer and ducks may eat the chips, cookies, popcorn, and bread that visitors feed them, these foods cause digestive tract problems (Pollick 1999). A further health problem arises when animals actively seeking human food begin to eat the trash left behind by visitors. A herd of deer in the Grand Canyon had to be destroyed when they began starving to death because plastic they ingested (grocery bags, candy wrappers, ziplock bags, etc.) was blocking the absorption of nutrients (Leslie 1995).

Aside from the problems associated with eating human food, behavioral changes caused by wildlife becoming attracted to people can have detrimental consequences to the animal. For example, wildlife that loses a natural fear of humans become easy targets for hunters or poachers. Wildlife seeking handouts are also more likely to get hit by cars because they are attracted to roaded areas where people are (Pollick 1999; Blount 1998). Unhealthy weight gain caused from eating human food may also cause an animal to be more susceptible to predation because they become slow and less able to escape quickly.

In addition to becoming less wary and able to avoid predators, other behavioral changes of beggar wildlife may have negative consequences for their chances of reproduction or survival. For example, a small group of deer typically spent part of the year at Phantom Ranch in the Grand Canyon. One year, after receiving and becoming accustomed to food handouts from visitors, the deer did not migrate out of the area, as

they normally did. Because the area did not contain enough natural food to support the deer year-round, the deer became dependent on human food for their survival (Leslie 1995). Another negative behavioral change from getting food handouts is that wildlife may become more tolerant of each other and live in greater densities than would normally be found. The higher density of a species increases the risk of a disease outbreak within the population (Pollick 1999).

Most of the negative impacts to wildlife from feeding discussed above impact individual animals. It is largely unknown what effects feeding and other recreationist caused disturbances has on populations and communities (Knight and Cole 1991). Clearly trapping and relocating problem animals has an impact on the individual animals, but the removal of animals could affect both the population from which the animal is removed and the one to which it is transferred. This may be especially true for animals such as bears, which typically occur in relatively low densities and are territorial. Even if a fed animal is not physically removed or relocated from an area, its change in behavior and change in diet may bring about significant changes to the ecosystem. Researchers in Rocky Mountain National Park suspect that visitors feeding Clark's Nutcrackers at overlooks may decrease forest regeneration and alter tree species composition. The birds play a key role in seed dispersal of limber pines, and the ecologists hypothesized that a decrease in their normal activities of seed storage and dispersal, due to handouts from visitors, could decrease the number of young limber pines (Tomback and Taylor 1986, cited in Knight and Temple 1995).

Dealing with problem animals

Once an animal begins to aggressively pursue human food and threatens visitors, managers must either destroy or relocate the animal because it is difficult to break wildlife of their begging habits. In order to prevent wildlife from becoming beggars, wildlife biologists have attempted various methods of aversive conditioning to drive animals away from humans and developed areas. The theory is that providing an unpleasant consequence in association with humans will teach the animals to avoid people, instead of having them associate humans with the positive outcome of a food

handout. In some National Parks, pepper spray is used to deter bears and ungulates from human food sources. The use of rubber bullets has also been tried to break animals of their association between humans and food (Pettersen 1995). If aversive conditioning does not deter problem animals from seeking human food, the animal has to be relocated or destroyed. While translocation seems like a better solution than destroying an animal, in reality the outcome is most often similar because of the high mortality rate experienced by translocated ungulates (Jones *et al.* 1997).

Although aversive conditioning may keep some animals from getting too close to visitors and begging for food, these methods are not the best solution for controlling human-wildlife interactions in a natural setting. One problem is that personnel applying these techniques have to be sensitive to how visitors perceive them (Pettersen 1995). Most visitors would be very upset if they saw a ranger pepper spraying or shooting a deer or bear with rubber bullets. This limits these techniques' usefulness in heavily used areas of parks. Also, it is the wildlife who are suffering because of improper actions by visitors. For the wildlife it is better to prevent positive association between humans and food than to deal with the problem of beggar animals after it has been created. In order to prevent wildlife feeding, managers have tried many different approaches to attempt to persuade visitors not to feed the animals in their parks.

Persuasion efforts used by agencies to prevent wildlife feeding

Many different techniques have been tried by natural resource managers to discourage visitors from feeding wildlife. These efforts can be classified as direct, heavy-handed or indirect, light-handed approaches (Lucas 1990; McAvoy and Dustin 1983). Direct management approaches emphasize regulation of behavior and restrict individual choice. A common direct management technique used to reduce feeding of wildlife is the imposition of fines. Related to this is the presence of law enforcement or other authority figures who can enforce the rules and fine visitors.

In addition to fining visitors for feeding wildlife, managers have also tried more indirect persuasion techniques to reduce the incidence of feeding. Indirect techniques

try to influence or modify the behavior of visitors, while allowing them to retain their freedom of choice. Examples are the use of interpretive signs, brochures, and park newsletter articles which explain to the visitor the potential negative consequences of feeding for them and the wildlife. A particularly aggressive campaign using educational material was used in Grand Canyon National Park after managers had to destroy the herd of beggar deer at Phantom Ranch. The park interpretive staff developed a message which bluntly educated the visitor about the consequences to the deer of being fed and the personal safety risks from getting close to wildlife (Chesher 1995). In an attempt to reach as many visitors as possible with the anti-feeding message, bookmarks were distributed to every group entering the park, small signs (table tents) were placed on every picnic table and in every hotel room, the park newspaper contained a large advertisement, and posters were displayed in busses, trains, bulletin boards, and other locations. The park also designed a special exhibit for the visitor center and the interpretive staff explained the problem during their programs.

Effectiveness of persuasion techniques

Unfortunately, despite the widespread problem of visitors feeding wildlife, few empirical studies have been conducted to assess the effectiveness of the various direct and indirect techniques used to reduce wildlife feeding behavior (McCool and Braithwaite 1992). One relevant study conducted in Yosemite National Park assessed the effectiveness of educational information on food storage in the backcountry to avoid encounters with bears (Cella and Keay 1979, cited in Braithwaite and McCool 1989). When surveyed, 95% of the backcountry campers indicated that they had received at least a brochure on food storage. Although 92% reported that they were storing their food properly, only 3% were actually storing their food according to recommended techniques. Although proper food storage to avoid attracting wildlife is not exactly the same issue as intentionally feeding wildlife, these results suggest that visitors do not behave as if they are concerned enough or educated enough about the negative impacts associated with wildlife eating human food to alter their behavior. The study reported here expected a higher compliance rate because it should be easier (i.e., take less effort)

for visitors to avoid doing something (i.e., not feeding deer) than it was for visitors in Yosemite to store food properly.

Results of a study that assessed the effectiveness of a fear appeal versus a moral appeal in reducing ground squirrel feeding in Crater Lake National Park suggest that wildlife feeding can be reduced significantly by informing visitors of the negative consequences of feeding (Schwarzkopf 1984, *cited in* Gramann and Vander Stoep 1987). Compared with the control condition, the fear appeal reduced squirrel feeding by 72%. The moral appeal was less effective, but still reduced feeding by 50% over the control. This study illustrates why is important to understand what message approach (e.g., fear vs. moral appeal) as well as intervention type (e.g., sign, brochure, fine) is most effective in eliminating feeding behavior.

The type of message approach that is most effective to gain compliance may also differ with the specific situation. While the fear appeal was the most effective in reducing squirrel feeding behavior in the example above, McCool and Braithwaite (1989) suggested that promoting moralistic, ecologicistic and naturalistic attitudes would increase appropriate behaviors to avoid grizzly bear contacts in the backcountry more than fear appeals.

The type of message that is most effective in gaining compliance is influenced by the motivations behind depreciative behaviors and the knowledge level of visitors. Gramann and Vander Stoep (1987) have described six types of damaging activities in natural resource settings and suggested that different persuasion techniques are needed to combat them. The reasons for participating in damaging activities range from unintentional to willful actions. Indirect, educational techniques can be effective in reducing some types of damaging activities, while direct, heavy-handed approaches are necessary to control others.

If wildlife feeding is due to uninformed violations, as some have suggested (Chesher 1995; Gramann and Vander Stoep 1987), informing visitors of the negative

consequences of that behavior should have a very high degree of effectiveness. These negative consequences can be presented as a “fear appeal,” which describes the potential harm to the person engaging in the risky behavior, or as a “moral appeal,” which focuses on the harm to the animal or resource (Gramann and Vander Stoep 1987). If the moral and fear appeals are presented in a way that emphasizes personal responsibility for behavior, the message may be effective in targeting individuals who are feeding because of the responsibility-denial type of violation. These appeals should also be effective in reducing wildlife feeding if people are doing it simply because they do not know that there are regulations against it (i.e., unintentional actions).

Some people may be induced into feeding wildlife because they see others doing it. This would be classified as a releasor-cue behavior. For example, people tend to litter more in already littered environments (Cialdini *et al.* 1990; Reiter and Samuel 1980; Krauss *et al.* 1978). It has also been observed that visitors to recreation areas tend to carve on picnic tables more if there is already carving present (Samdahl and Christensen 1985). Although the presence of authority has been shown to reduce releasor-cue violations, it is not practical to have law enforcement present in a given area all of the time. Perhaps the best way to combat this type of violation is to reduce the behavior by other visitors, thereby reducing the releasor-cue frequency of occurrence.

Related to this releasor-cue type violation is the behavior of the deer or other wildlife. The physical presence of a deer or squirrel in a picnic area and their begging behavior may signal the visitor that it is acceptable to feed wildlife. Clearly, persuading visitors not to feed wildlife will reduce not only the visual cue of seeing someone else feed wildlife, but will also reduce begging behavior of the animal because they will not continue to beg if they do not receive handouts frequently.

Other reasons for feeding wildlife, such as a status-confirming or willful actions, are not as easily combated with indirect persuasion techniques. Individuals committing status-confirming violations are motivated by a desire to impress a socially important referent group. Interventions to reduce this type of behavior must try to form a

relationship between the violator and the area or resource, which will counteract the negative peer influence (Gramann and Vander Stoep 1987). Willful actions are done even though the violator knows that the actions are wrong. These types of actions would require a more heavy-handed approach, such as an increased presence of authority, which as has been discussed is not preferred by managers because it is impractical and would be unpopular to have law enforcement stationed everywhere in an area.

The research presented here assumes that wildlife feeding is more of an uninformed or unintentional type of violation, and not a willful action intended to cause harm. Therefore, this study focuses on indirect, educational interventions that will inform visitors about the negative consequences of feeding wildlife (both to themselves and to the deer). Because visitors feel positively toward wildlife, it is reasonable to assume that they would not feed wildlife if they were better informed about why they should not feed them. Visitors should also want to protect themselves and their families from dangers associated with wildlife feeding if they know about them. The purpose of the interventions will be to change attitudes about wildlife feeding through persuasive messages, which will hopefully in turn influence behavior to decrease the occurrence of wildlife feeding. Ajzen's (1985, 1987) Theory of Planned Behavior describes the relationship between attitudes and behavior and Petty and Cacioppo's (1986) Elaboration Likelihood Model describes how persuasive messages influence attitudes.

Attitudes and behavior

Ajzen's (1985, 1987) Theory of Planned Behavior has been used to predict behavior in leisure settings (Ajzen and Driver 1992). The theory proposes that attitudes toward the behavior, subjective norms, and perceived behavioral control interact to form a person's behavioral intentions, which lead to the performance of a certain behavior (Figure 1). Subjective norms are perceptions of the expectations of important others. In the case of feeding wildlife, the visitor may consider the reactions of other group members when he or she decides whether or not to feed. The group one is with could make a significant difference. For example, a peer referent group may approve of and even encourage feeding deer, while parents would disapprove. Perceived behavioral

control relates to the perceptions one has about his or her ability to perform the behavior. This is often related to the relative ease of performing the behavior. For example, one may believe that recycling is good and have positive attitudes about it, and believe that significant others think that it is a good thing to do, but the recycling bin is 100 yards farther down the sidewalk from the trash can so the effort of performing the behavior hinders the person from recycling.

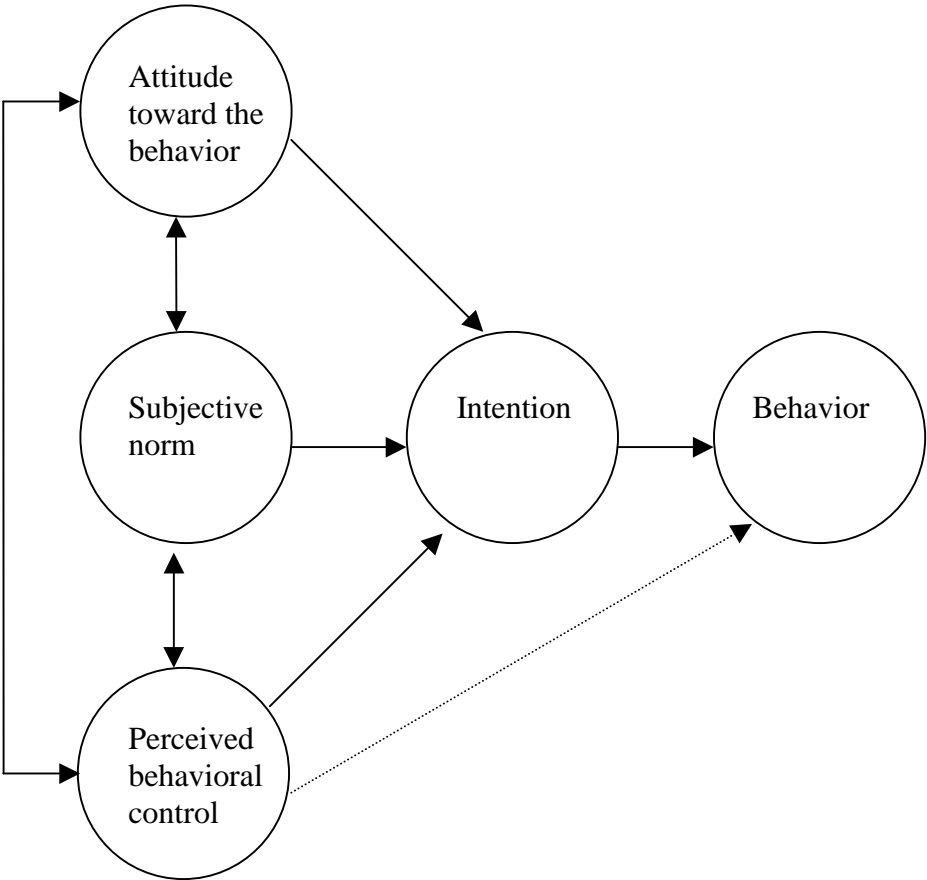


Figure 1. Theory of Planned Behavior (Ajzen 1987).

Attitudes, therefore, are not the only motivational force behind behaviors. The perceived social pressure to engage in a behavior as well as the perceived ease of

performing the behavior are also antecedents to behavioral intention. Even if a person intends to perform or not to perform a certain behavior, other variables may interfere, thereby weakening the behavioral intention-behavior correlation.

Although perceived normative influence and behavioral control influence behavior, attitudes have been shown to be relatively good predictors of behavior (Kraus 1995). There is a stronger correlation between attitudes and behavior when both are measured at the same level of specificity (Petty 1995). The level of specificity in the attitude and behavioral measures should be the same for both the target object and the action (Kraus 1995). For example, a general positive attitude toward the environment might not be a very good predictor of a person's recycling behavior in a specific situation. Therefore, asking people if they care about or enjoy watching wildlife would not necessarily be a very good predictor of deer feeding behavior. This study will ask specific attitude questions in an attempt to understand the persuasive abilities of different intervention messages on changing deer feeding attitudes and behavior.

An additional consideration is the strength of the attitude or attitude certainty (Kraus 1995). Stronger attitudes predict behavior better than weaker ones. This has implications for persuasion because attitudes formed from the central route (see below) should be stronger than those formed from the peripheral route (Petty 1995). Therefore, all of the variables which influence the route of persuasion (accessibility, direct experience, etc.) affect attitude strength and the attitude behavior relationship (Kraus 1995; Petty 1995).

Although not always very predictive of behavior, attitudes have been shown to influence behavior and are the target of persuasive messages. In summary, attitudes most influence and predict behavior when they are accessible, strong, not in conflict with subjective norms and when constraints to follow through with the behavior are minimal.

Attitudes and attitude change

In order to persuade a visitor not to feed deer by using a message, one must first understand the attitudes people have about deer and feeding deer. An attitude can be thought of as an evaluation a person holds about an object or issue. Attitudes can be based on affect (emotion), cognition (belief), behavior, or some combination of the three (Petty 1995). Persuasion involves changing the attitudes that people hold about an object or issue, and it is hypothesized that there is more than one way possible to change an attitude.

The primary model used today is the Elaboration Likelihood Model of persuasion, which was developed by Petty and Cacioppo (1986). This model describes two principal routes of attitude change (Figure 2). In the peripheral route, attitude change involves relatively non-effortful thinking. In contrast, the central route involves careful and effortful thinking to evaluate the information or arguments presented. The central route is equivalent to Chaiken's (1980) systematic information processing. The central route of persuasion has been shown to produce an attitude which is more resistant to change, enduring, and more predictive of behavior than the peripheral route because of the effortful thinking and elaboration involved (Petty and Cacioppo 1986).

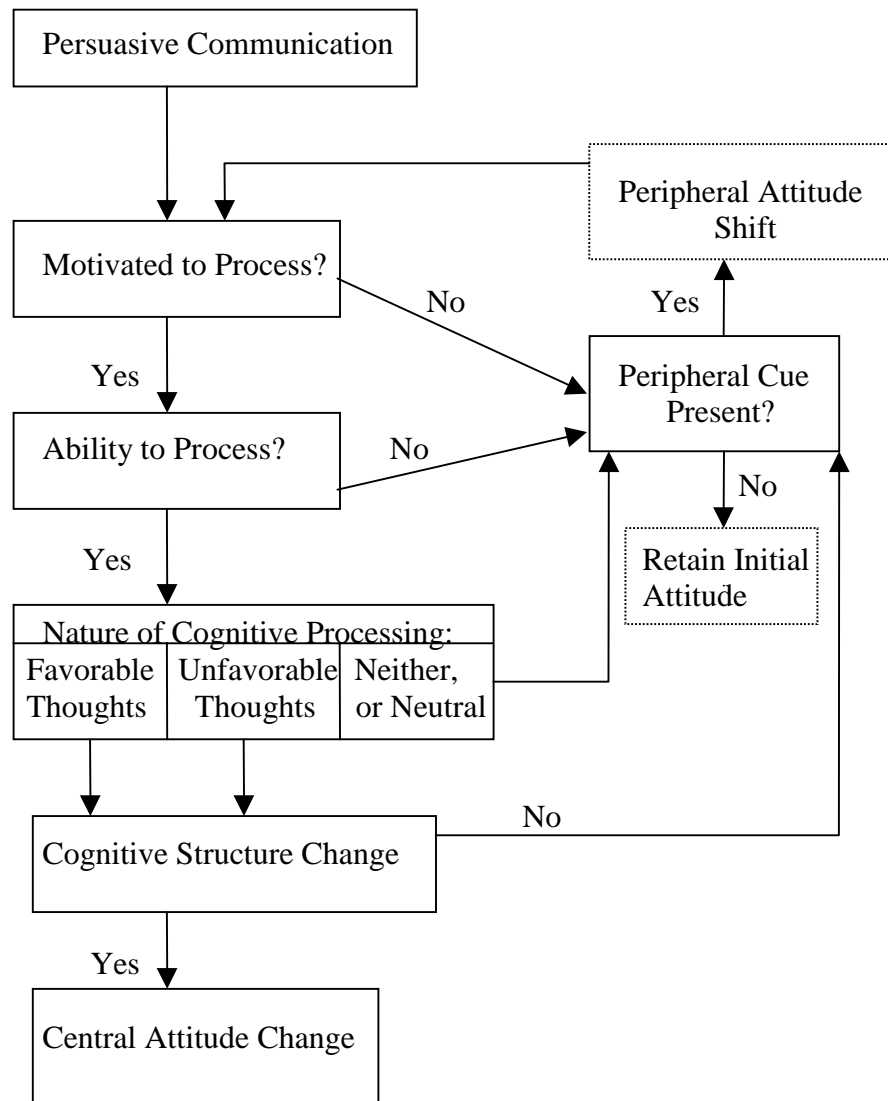


Figure 2. The Elaboration Likelihood Model of persuasion (Petty and Cacioppo 1986).

The route used by an individual in a given situation is determined by his or her motivation and ability to process the information. People are constantly bombarded by information every day. It would be impossible and maladaptive for people to spend a lot of time thinking about every piece of information they see, especially if that information is not deemed personally relevant or important (Petty 1995). According to the model, if

people are not motivated or able to process the message content, they may react to the presence of a simple cue to guide them.

One simple cue is the credibility of the source. Visitors might simply decide not to feed deer because they view the National Park Service as a credible source for information on wildlife and how to behave in the National Parks. Rather than evaluating whether the advice or rule is logical, they simply do what Uncle Sam says. There is some experimental evidence that park visitors view rangers and the NPS as reliable sources of information. Braithwaite and McCool (1989) found that backcountry visitors considered park and wilderness rangers as well as park signs and brochures to be the most important and reliable referent sources for providing information on how to behave in grizzly bear habitat.

Another peripheral cue, which is relevant for video and personal contact, is the attractiveness or familiarity of the source. When not motivated to process information carefully, visitors may simply comply with suggestions if an attractive or famous person delivers the message. The number of message arguments may also serve as a simple cue if the person is not motivated to process the information (Petty and Cacioppo 1984). For example, a person unmotivated to process is more likely to comply with a message with ten arguments listed to support the claim than if only two or three arguments are given, regardless if they actually read the arguments or not.

Individual and situational factors may also affect the motivation or ability to process a message (Petty and Cacioppo 1986). One individual factor is a person's need for cognition. Some people simply like to think more than others, which motivates them to process information through the central route (Cacioppo *et al.* 1986). Other individual characteristics such as general intelligence and tendency toward being open or closed-minded also influence the amount of thinking about an issue (Petty 1995). Because all visitors do not have the same cognitive abilities, it is important to avoid long and complex messages in order to increase the likelihood that the majority of visitors are able to process messages (Petty *et al.* 1992).

Personal relevance or involvement also influences a person's motivation to process a persuasive message by the central route (Petty and Cacioppo 1986; Chaiken 1980). Increased personal relevance motivates a person to process message arguments more thoughtfully. As relevance increases, subjects discriminate more between strong and weak arguments (Petty and Cacioppo 1986; Leippe and Elkin 1987; Petty and Cacioppo 1984). In addition to discounting weak arguments, a highly relevant issue also causes people to be less affected by simple cues, such as number of arguments (Petty and Cacioppo 1984). Although high personal relevance has been shown to increase thinking, a high personal relevance may also mean that the person has already done considerable issue-relevant thinking, which makes the attitude more stable and resistant to change (Petty and Cacioppo 1986).

Prior knowledge or experience with the specific attitude object or issue has been shown to have a direct effect on the persuasion process (Manfredo and Bright 1991). Increasing levels of prior knowledge tends to decrease the amount of elaboration of a message and makes it more difficult to change the attitude because the attitude is more stable. In support of these findings, research in recreational settings has shown that inexperienced users are influenced more by a persuasive message than experienced users (Roggenbuck and Berrier 1982; Krumpal and Brown 1982).

Attitudes derived from direct prior experience have been shown to be more resistant to counter-attitudinal appeals than those obtained indirectly (Wu and Shaffer 1987). Wu and Shaffer (1987) also found that direct experience attitudes were more accessible than indirect experience attitudes. Attitude accessibility is another variable which impacts the thought process. Subjects with less access to beliefs and prior experiences change their opinions to be consistent with a persuasive message more than those with greater access (Wood 1982). High accessibility to attitude-relevant information also encourages more discriminatory thinking, which makes the quality of the argument important (Wood *et al.* 1985).

Another key variable affecting motivation to process is the level of personal responsibility attributed to the situation (Petty and Cacioppo 1986). The higher the level of personal responsibility attributed to the situation, the greater the chance a person will process through the central route. Therefore, persuasive messages that tell the receivers that they are personally responsible for their actions and the resulting outcomes should be more effective in influencing behavior than ones in which no sense of personal responsibility is communicated.

While individual factors are interesting and influential, except for keeping the message easy to understand and attempting to encourage a sense of personal responsibility, they cannot be manipulated by a resource manager attempting to increase the persuasiveness of his or her message. For example, a manager has no control over visitor intelligence, need for cognition, or past experience. Situational factors, however, can be more easily manipulated to convince a person to think about the messages more seriously.

One situational factor, which Park interpretive staff might consider, is the amount of external distraction around the location or point in time when their message is communicated to the visitor (Petty and Cacioppo 1986). An exhibit containing a persuasive message should not be placed where it has to compete with other things (e.g., scenery, heavy traffic areas) for the visitor's attention.

Repetition is another situational variable that is under the control of the interpretive staff (Petty and Cacioppo 1986). However, the effect of repeated exposure to a message is complex. Although repeated message exposure increases the amount of time a person can attend to the message, which should increase persuasion, too much exposure could cause the person to react negatively to the message (Cacioppo and Petty 1979). On the other hand, repeated message exposure might be important for peripheral processing, where it is necessary to keep reminding a person because of short-term attitude change. Multiple messages in a park also increase the likelihood of at least one of the signs catching a person's attention.

Although natural resource managers should provide peripheral cues for visitors because some will respond to simple cues, it is important for them to understand how to motivate people to carefully process their messages so that more stable attitude change occurs. While there has been considerable research about persuasion in the social psychological literature and there is some understanding of how different variables influence persuasion, more research is needed in outdoor recreation contexts to better understand both the motivations behind inappropriate behaviors and the persuasive techniques that are most effective in gaining compliance with regulations and management goals.

Because of the sometimes weak relationship between attitudes and behavior, it is important that research focuses on actual behavior as well as measuring attitudes, when evaluating the effectiveness of a persuasive technique or message. Unfortunately, behavioral intentions and self-reports of behavior, are the most commonly used assessment measures (Roggenbuck 1992). These methods are inferior to actually measuring behavior because behavioral intentions do not always predict behavior and social biases encourage respondents to report behavior that is perceived to be favorable to the interviewer or survey administrator.

Although attitudes do not always predict behavior, attitude measurements have suggested the positive influence of persuasion in outdoor recreation settings. For example, Olson *et al.* (1984) found an increase in knowledge and support for nature preserve management following exposure to educational brochures and interpretive programs.

Although not common, there have been a few studies that have compared the effectiveness of different persuasive techniques on changing behavior in outdoor recreation settings. For example, Johnson and Swearingen (1992) evaluated the effectiveness of different messages in reducing off-trail hiking in a meadow. They found that trailside signs were able to reduce off-trail hiking over the no sign control, however different messages gained a greater amount of compliance than others. The

sanction message was most effective, followed by a moral appeal, a humorous sign, and a no hiking symbol.

Other research has investigated how multiple techniques influence compliance with recommended management policies and regulations. Vander Stoep and Gramann (1987) studied the influence of different persuasion techniques on reducing inappropriate activities, such as youth climbing on monuments, in a military park. All three persuasion techniques (awareness of consequence message, message + resource protector program, and message + protector + incentive) were effective in reducing the amount of depreciative behavior at the site. Surprisingly, there were no significant differences between the different techniques.

In another study, Roggenbuck and Berrier (1982) looked at the effectiveness of different communication strategies (brochure and a brochure + personal communication) in encouraging the dispersal of backcountry campers from a heavily used area. They found that the brochure alone was effective in dispersing campers and that the brochure plus personal contact was most effective in dispersing campers if the group size was small, if the group was inexperienced, and if contact was made more than 3 hours before dark.

In a recent study, Hendricks *et al.* (1999) evaluated both type of message appeal (moral vs. fear) as well as message source (biker volunteer, hiker volunteer, uniformed volunteer) in promoting proper trail etiquette by cyclists on a multi-use trail. They found that speed of bikers was influenced by the messages and that the moral appeal was most effective in reducing speed, especially when it was presented by another biker.

One limitation of the studies above is that they only measured behavior and not attitudes. Therefore, it is difficult to know what route (central or peripheral) was used in message processing. For example, it is impossible to know from the results whether simple peripheral cues (e.g., message source) were used to influence behaviors or whether the messages were processed carefully and a stable attitude change occurred.

One study conducted in Petrified Forest National Park measured both attitudes and behaviors of Park visitors under different interventions (uniformed volunteer, interpretive sign, and a pledge) designed to reduce petrified wood theft (Roggenbuck *et al.* 1997). All three interventions reduced theft by approximately one-third. Because the researchers also conducted an attitudinal survey, they could further describe the beliefs and characteristics of thieves and non-thieves. This research follows the above example by measuring behavioral changes as well as changes in knowledge and attitudes with two different messages.

Interventions

The interventions tested in this study were designed to promote central route processing by giving clearly stated reasons for not feeding deer. The messages were framed in terms of a moral appeal and a fear appeal. Both of these strategies (fear and moral appeals) are currently being used in Shenandoah and other National Parks to try to persuade visitors not to feed deer.

It seemed probable based on other research (e.g., Cole 1998) that it would be challenging to get visitors to attend to the messages. Therefore, one message used a novel, somewhat humorous approach to get the attention of park visitors and motivate them to read and think about the message. It was intended to tap into positive feelings toward deer and imply a personal moral responsibility not to feed the deer because it could harm the deer. The second message was a fear appeal that motivated visitors to think about the message because of the risk of potential harm to themselves while feeding the deer. Although the message tone was not novel as with the moral appeal, the message itself presented novel information because pre-testing suggested that visitors lacked knowledge about the personal risks associated with getting close to deer.

Novel or unpredictable patterns in message design have been shown to attract attention in advertising (Solomon 1992). Lynch and Srull (1982) also found that information that is novel or unexpected effectively captures attention, is processed more extensively and is more likely to be recalled. The moral appeal message was addressed

to the deer instead of the visitor to make it a novel message approach and stand out from typical “Do not feed wildlife” Park Service signs. This hopefully lighter and more humorous approach to conveying information should encourage the visitor to read the entire message. In fact, humor has been shown to increase attention to magazine advertisements (Madden and Weinberger 1982). However, Dwyer *et al.* (1989) did not find an increase in compliance with campground regulations with a humorous brochure.

Fear appeals

Fear appeals are used to convey potential hazards in the environment and the risk associated with those hazards. They are designed to scare people into doing what the message recommends. While assessing potential threats, people consider the perceived severity of the threat as well as their perceived susceptibility of experiencing the threat (Witte 1992). The level of severity and susceptibility has been shown to predict compliance with immunization of children (Smith 1997). In addition to describing a threat, fear appeals also suggest a recommended course of action to avoid the threat (Witte 1993). Perceived response efficacy (belief that a given response prevents the threat) and perceived self-efficacy (beliefs about one’s own ability to perform the recommended action to avoid the threat) also influence attitudes and responses to a fear appeal (Witte 1992). Self-efficacy is analogous to the “perceived behavioral control” element in the Theory of Planned Behavior.

Fear appeal style also impacts the persuasive ability of the message. Witte (1993) states that a message with high fear appeal should contain personalized, intense, and emotional language. In other words, the message should clearly and graphically describe the threat and risk to a visitor. In order for the threat to be taken seriously, it also must be believable. This clearly is the most challenging aspect of designing a fear appeal about the threat and risk of feeding deer, because people generally do not believe that deer are dangerous.

In order to promote central route processing, a fear appeal should gain a visitor’s attention with a word that signals personal relevance. The specific word signals the

severity of the threat or hazard, because people discriminate between words such as DEADLY, DANGER, and CAUTION (Drake *et al.* 1998). The signal word should be followed by a description of the hazard and consequences. The message should also provide instructions for avoiding the hazard, such as not getting too close to wildlife.

Another important component of a fear appeal, which is frequently omitted in Park information on wildlife hazards, is the potential risk or probability that a person will experience the hazard if he or she does not take action to avoid it. The level of susceptibility to a hazard has been shown to influence the willingness to read warnings (Wogalter *et al.* 1991) and to predict compliance (Smith 1997).

The level of risk involved with non-compliance is a critical piece of information for the Park –at least if risks are high– to provide because people are prone to thinking optimistically about their own personal risks (Weinstein 1984). Even with the threat of serious injury, people often react to warnings about wildlife with an “it won’t happen to me” attitude (Jope and Shelby 1984). Social psychologists have suggested that the underestimation of personal risk is due to biases associated with cognitive processes, such as protecting self-esteem (Weinstein 1984), and errors in the assessment and processing of information available while making the personal risk prediction (Tversky and Kahneman 1974).

Level of risk is a difficult piece of information for the Park Service to provide because the relevant statistics are not always available. Even if they were, the occurrence of injury from wildlife is most likely so low that the probability of negative consequences from non-compliance would not encourage proper behavior during interactions with wildlife. In other words, in these cases, people’s subjective assessments of low vulnerability may be accurate. For this reason, the level of risk was omitted from the fear appeal in this study.

Fear appeals are commonly used in recreational settings to gain compliance with rules and regulations. The most common type of fear appeal used is the sanction

message (e.g., “Unlawful to feed wildlife - \$25 fine”). Such messages have frequently been found to be the most effective way to deter depreciative behavior (e.g., Gramann *et al.* 1995; Johnson and Swearingen 1992; Martin 1992), although the threat of fines for feeding wildlife does not reduce this inappropriate behavior to an acceptable level. Other fear appeals in outdoor recreation settings warn visitors of the dangers from getting too close to cliff edges, swift running water, and wildlife.

Moral appeals

Unlike the fear appeal message, which encouraged visitors to not feed wildlife in order to prevent harm to themselves, a moral appeal encourages people to behave in a manner that will help others or the environment. Kohlberg *et al.* (1983) suggest that there are six stages of moral development. The first two stages are described as preconventional morality, where the person acts simply to avoid punishment or to avoid or minimize pain. Fear appeal messages operate at this level. People at these stages of moral development would avoid feeding wildlife to avoid a fine or to avoid getting injured. At more advanced, or conventional, stages of moral development people become concerned about others and they believe that they should respect laws and sanctions. Altruism becomes important, and people are willing to sacrifice for the good of others. The moral appeal used in this study was designed to educate visitors about the negative effects feeding has on wildlife in order to gain their sympathy and encourage altruistic behaviors (i.e., not feeding the deer for the benefit of the deer).

Two key components to increase the effectiveness of a moral appeal are awareness of consequences (AC) and ascription of responsibility (AR). These concepts were borrowed from Schwartz’s (1970) Norm Activation Model, which was originally developed to explain altruism and helping behavior. The model predicts that in order for a person to perform an altruistic act he or she must be aware of the consequences of his or her action (or inaction) *and* feel a personal responsibility to act. Therefore, the message about feeding deer should provide information about the negative consequences for the deer as well as promote a sense of personal responsibility for acting in a way that will help the deer and not injure it.

The limited research in outdoor settings using evaluating the effectiveness of including AC and AR in messages has shown mixed results. Van Liere and Dunlap (1978) found that AR had a strong correlation with yard burning behavior, with AC only showing a weak correlation. In a study evaluating behavioral intentions to obey regulations in an outdoor setting, Gramann *et al.* (1995) found that the relative effects of AR, AC, and sanctions differed with the specific context of the situation posed to subjects.

Research Objectives

The primary purpose of this research was to evaluate the effectiveness of two different intervention messages (moral and fear appeal) in promoting anti-feeding attitudes and reducing deer feeding behavior by visitors to Shenandoah National Park over control conditions. The specific objectives were as follows:

1. Describe the knowledge, beliefs, and attitudes of Shenandoah National Park Visitors toward deer and deer feeding in the Park.
2. Evaluate the impacts of a moral appeal and a fear appeal message on knowledge, beliefs, and attitudes of visitors about feeding deer in Shenandoah National Park.
3. Evaluate the effectiveness of the moral and fear appeals in reducing deer feeding behavior by Shenandoah National Park visitors.

The first two objectives were accomplished by using both qualitative (interviews with visitors) and quantitative (survey of park visitors) methods. The second objective was addressed by directly observing visitors involved in close interactions with deer in Shenandoah National Park.

METHODS

Interventions

The structure and language of both the moral and fear appeals were designed by consulting the literature on these types of appeals and by considering comments from visitors made during pre-test interviews (n=13) conducted in October 1998. The pre-test interviews were conducted in Big Meadows and Elk Wallow Picnic Areas and Big Meadows Campground. The interviews asked individuals and groups, who were observed interacting with deer at a close distance (within 20 yards), about their opinions about deer and feeding deer in Shenandoah National Park (Appendix A). Both feeders (n=6) and non-feeders (n=7) were interviewed. These interviews suggested that feeders and non-feeders had very little knowledge about the dangers to themselves from feeding deer. On the other hand, even feeders seemed to have considerable knowledge about the negative consequences that feeding has on deer and other wildlife.

The messages were designed to be persuasive and promote central route processing by making the messages personally relevant (increasing motivation to process carefully). The fear appeal motivated the visitors by using personal language encouraging them to protect themselves and their families from a potential danger. The moral appeal tried to instill a sense of personal responsibility by saying that even one apple could seriously injure a deer. This was meant to combat feelings that just one person feeding deer would not matter.

The sign was also structured and presented in a manner in which the majority of visitors should have been able to process the message. The language in both messages was colorful, but kept relatively simple (i.e., it did not contain technical scientific terms) so that most visitors could comprehend the message. Sign placement was also meant to enhance the ability to process. The messages were posted on picnic tables in the picnic areas and campsites, which was hopefully in a semi-private area where the message could be attended to without major distractions. It was also hoped that placing the messages on picnic tables would enhance the chance that visitors would read the messages a short time before they were tempted with the opportunity to feed deer.

In addition to motivating the visitor to process the message and providing a message and situation conducive to processing, both messages were also designed to provide little in the way of obvious peripheral cues. The National Park Service name or logo was not present on the messages (although message source was probably inferred) to reduce the impacts of a source cue. The messages were also kept uniformly simple by not displaying flashy graphics.

There was a considerable attempt made to keep the messages as similar as possible on variables that might influence message processing, other than the primary variable of a moral versus a fear appeal. For example, sign layout was the same, the warning word was the same, the number of arguments presented was the same, and the length of the message was similar. The only difference, other than the type of message, was the message tone. The fear appeal was presented as a typical Park Service sign instructing visitors not to do something. Because pre-testing suggested that visitors were already fairly knowledgeable about the moral appeal message, a novel message tone (addressing the message to the deer) was taken to increase the chances of catching the attention of Park visitors.

The fear appeal (Figure 3) was designed to inform visitors about the risks of feeding wildlife to their personal safety. The message included the key factors of a fear appeal: a signal word (Danger), description of the danger (four bulleted points), and instructions on how to avoid the danger (do not feed or approach deer). The moral appeal (Figure 4) instructed the visitors about how feeding hurts the deer (awareness of consequences) and encouraged the visitor to feel personally responsible for keeping deer healthy by not feeding them (ascription of responsibility).



Attention All Campers - Danger!



Never feed deer.

Although deer may appear tame and gentle, they are wild. Deer are unpredictable creatures and could seriously injure you.

If you feed a deer, it...

- may suddenly bite you.
- may kick you with its powerful legs and sharp hooves.
- may gore you with its hard, pointed antlers.
- may expose you to diseases that could make you very sick.

Protect yourself and your family. Never try to feed or approach deer or other wildlife in the park.

Figure 3. Fear appeal.



Attention All Deer - Danger!

Never accept food from humans.



Although visitors mean well by offering you food, accepting even one apple could seriously hurt you.

Human food may taste good, but it...

- may make you sick.
- may make you fat and slow – an easy target for predators and cars.
- may make you trust all humans – making you easy prey for hunters.
- may make you dependent on humans and unable to find natural food.

Protect your health. Resist the temptation and never accept food from humans.

Figure 4. Moral appeal.

Experimental design

The attitudes and behaviors of visitors in the two treatments (fear and moral appeals) were compared with visitors under control conditions to evaluate any changes after message exposure. The control condition was simply the messages about deer, bears, and other wildlife that were present in Shenandoah National Park prior to the study. The most visible messages for all visitors were the signs stating “Unlawful to Feed Wildlife - \$25 fine,” which were located in many locations along Skyline Drive (the only road through the park). There were also messages informing visitors entering the Big Meadows area that it was “Bear Country” and that they were required to store their food properly. Campers were also exposed to messages about proper food storage

and not feeding wildlife in the campground regulations and signs located around the campground (e.g., registration booth and bathrooms). An educational sign about Shenandoah deer was located in the picnic area that told how to help the deer by driving slowly and not trying to feed or approach them. Unfortunately, this sign was located in a corner of the picnic area, and I did not notice a single picnicker reading the sign during the study period.

Campground methodology

The fear and moral appeal signs were taped onto picnic tables at each unoccupied campsite on Thursdays and Fridays of treatment weekends (9 July to 15 August 1999). Most campsites were vacant during this time, therefore 75-85% of the campsites received the treatments. The locations of campsites that did not receive a message were recorded so that those individuals were not observed or asked to fill out a survey. Only one message (moral or fear) was administered in the campground on a given weekend. After check-out time on Sundays the signs were removed. The weekend treatment condition (control, moral appeal, or fear appeal) was randomly assigned within a three-week time block. The sampling was blocked in order to minimize any influences that seasonal changes in vegetation may have on the movements of deer in the campground. Each experimental condition (control, moral appeal, and fear appeal) was assigned to two weekends, therefore the sampling lasted a total of six weeks.

Big Meadows Campground (179 campsites) was divided into two observation zones in order to increase the number of contacts with visitors. Because there was only a brief window of time in the morning to survey visitors and the campground was so large, it was determined that more surveys could be collected if sampling was concentrated in one area at a time. Sampling the entire campground, instead of in zones, would also have limited the sampling to one morning on the weekends instead of two because visitors sampled on Saturday mornings could have talked with their neighbors about the study, which would have contaminated the results. The sampling zones were separated by roads. Therefore, it is unlikely that visitors spoke with people in the other zone about the survey or study.

The researcher began sampling for the observational component of the study on Friday evening (between 5 and 6 p.m.) by walking around the campground and looking for deer. The location of the first deer seen determined the zone to be sampled for that evening. The researcher then followed the deer or deer herd and recorded deer and camper behavior when deer were located within an occupied campsite. The observer attempted to monitor visitor behavior without being noticed by staying as far away from the interaction as was possible. At times the interaction lasted for several minutes so the observer pretended to be identifying plants and trees to avoid suspicion. An interaction was considered to occur only if a deer was located within a person's campsite. When deer left the campground, lay down to rest, or entered the other observation zone, the observer searched for another deer or herd to observe and follow.

During interactions, deer behavior was classified as ignoring people, approaching people, moving away slowly from people, spooking (i.e., a startle response followed by rapid movement away from people), and grazing. Visitor behavior was classified as ignoring, watching, approaching, photographing, following, and feeding (or attempting to feed) deer. Often, more than one type of behavior was recorded for both the people and the deer during the observed interaction. For example, someone may have begun by watching a grazing deer and then he or she may have proceeded to approach the deer until it spooked. The presence of other people was recorded (other visitors were distinguished from park staff) as well as the presence of any obvious food sources. The closest distance between the deer and the camper that occurred during the interaction was also estimated and recorded. Each adult present in the campsite was coded separately and personal characteristics were noted (e.g., gender, age, hair style) so that the individual observed could be given a survey the next morning.

Campers in the zone in which observations were made Friday night were contacted to fill out a short (two-page) survey Saturday mornings (8:30 - 11:00 a.m.). Respondents were guaranteed anonymity. An attempt was made to first survey all individuals who had been observed the previous night. After those individuals had been contacted, all other adult campers present at their campsites within the sampling zone

were approached to fill out a survey. The zone that had not been sampled Friday night was monitored for deer-visitor interactions on Saturday evening and was surveyed Sunday morning.

Picnic area methodology

Methods in the picnic area changed over the course of the study. Initially, observations of behavior and interviews with feeders and non-feeders were conducted, to illuminate findings from campground studies. Thus, no treatments were used for this phase (9 July to 15 August). However, campground results led to a decision to include treatments in the picnic area, as explained below.

During the 6 weeks of the campground study, the researcher observed deer-visitor interactions in the nearby Big Meadows Picnic Area, during the afternoon hours (12:00 - 5:00 p.m.) on weekends,. Interactions were considered to occur when deer were located within approximately a 10-15 yard radius around a group's picnic table. The observer sat unobtrusively within the picnic area (on a blanket reading a book) and watched for deer to enter the area. While observing deer interacting with visitors, the researcher recorded deer behavior (ignoring people, approaching people, begging for food, or grazing) and human behavior (ignoring, chasing away, watching, photographing, and feeding). Subsequently, during control conditions only, the observer initiated contact with groups that had interacted with deer, and asked for permission to ask them some questions about their experience with deer in Shenandoah National Park. They were told the interview was part of a research project for a graduate student at Virginia Tech.

After obtaining permission to record the interview (no one refused), the researcher conducted a semi-structured interview designed to probe into visitor knowledge and attitudes about deer and feeding deer in Shenandoah National Park (Appendix A). The interview was designed to characterize the visitors by some potentially influential variables (experience in SNP, number of deer seen on the trip, and knowledge of rules on feeding wildlife), which were also included in the survey

instrument. The interview was structured with easy-to-answer questions first in order to build a rapport with the respondents. Instead of asking visitors whether or not they thought that feeding deer was OK (as had been done in the pre-test), respondents were asked to indicate both reasons why they thought that the Park Service should encourage and reasons why they should discourage visitors from feeding deer. This technique was used in order to get both perceived pros and cons of feeding wildlife, instead of only one side of the issue. Probes were used to elicit more detailed responses to these questions.

An attempt was made to interview all groups observed interacting with deer. Initially, feeders were prioritized for the first interview if both feeders and non-feeders were present. However, after it became apparent that feeders were more prevalent than non-feeders, non-feeders were targeted in order to obtain a large enough sample size of both groups. When only all feeders or all non-feeders were present, the first group interviewed was selected randomly.

Interviews were only made during control conditions. The moral and fear appeals were not placed in the picnic area while interviews were being conducted. Because there had been only one observation of a camper feeding deer during the six study weekends in the campground, and the frequency of observed feeding was much higher in the picnic area, it was decided to continue the behavioral study in the picnic area. The treatment (moral or fear appeal) was randomly assigned by weekend day. No interviews were conducted during the treatment conditions because obtaining interviews limited the number of observations that could be made and the summer tourist season was ending. Interviews limited the number of observations the researcher could make because once an interview was conducted in the picnic area the observer's cover was blown. Remaining unobtrusive allowed the researcher to observe groups even if they were sitting nearby and allowed the researcher to follow the deer around the picnic area without drawing suspicion. This maximized the number of observations one could obtain in the limited amount of time available.

Survey instrument

The survey was primarily designed to test the influence of the fear and moral appeals on attitudes and beliefs about deer and feeding deer (Appendix B). The effectiveness of the interventions in changing beliefs was determined by asking respondents their level of agreement with statements taken directly from the two messages. Other items related to the two messages, but not specifically mentioned, were included in order to assess any possible message elaboration that may have occurred. The survey also included questions to address variables that could potentially influence responses, such as basic demographic information (gender, age, and education), past experience in Shenandoah National Park, number of deer seen, and the importance of wildlife viewing to the trip.

Aside from the focus of this research, survey questions were included that attempted to characterize the visitor experience associated with seeing deer. At the request of park managers, questions about preferences for different deer management policies were also included. An opportunity to self-report interactions with deer was also included, in case it was not possible for the researcher to observe individuals interacting with deer.

Data analysis

Behavioral observation data were analyzed using a Chi-square test because the observations represented counts. Although the attitude scale was not continuous (5-point Likert-type scale from +2 to -2), it was treated as such, and the individual items were analyzed using analysis of variance (ANOVA). Post-hoc pairwise comparisons were conducted using the Tukey-Kramer method.

RESULTS

Sample size

Campground

More than 100 campers were surveyed for each treatment (Table 1). The campers in general responded positively to filling out the survey. The few refusals (8.5%) were mostly from individuals who were cooking or preparing to leave their campsite, and a few visitors did not speak English.

Although the campground was fully booked every weekend during the experiment, unfortunately for this study, relatively few people (n=64) were observed interacting with deer in their campsite (Table 1). This was not because deer avoided the campground. Deer were commonly seen grazing in the campground, but were not always in occupied campsites or were in a site when people were not around. Although they were not often seen in occupied sites, the deer did not appear to be afraid of people, even if they were approached. Observations were also limited because the researcher was only able to look for deer in the evenings (because of administering surveys in the mornings, and observing people and deer in the picnic areas during the daytime), and during this time period people were not often at their campsite. Many visitors arrived late on Friday (well after dark) and did not return on Saturday until after dark. Deer were more commonly seen in occupied campsites in the mornings, and were even present in a few of the campsites when the survey was administered.

Table 1. Number of surveys obtained and deer-visitor interactions observed in the campground.

Treatment	# of surveys	# of observations (individual) ¹
Control	111	20
Moral	115	17
Fear	116	27
Total	342	64 ²

¹ Observed interacting with deer in their own campsite.

² Gender: 32 males, 32 females

Picnic area

Groups that had interacted with deer in the picnic area were only interviewed under control conditions. During treatment conditions (moral and fear appeals) interviews were not attempted, in order to maximize the number of observations. As discussed previously, conducting interviews limited the number of observations the researcher could make because the researcher was unable to remain incognito.

Observations of deer and human behavior were made under control and treatment conditions of all groups of picnickers if deer entered their picnic area. Unfortunately, because the fear and moral appeals were added late and despite only observing (i.e., not interviewing) picnickers, fewer groups were observed interacting with deer in the picnic area while signs were present than under control conditions (Table 2).

It was not possible to interview every control group observed because of inclement weather, or groups leaving the area while I was interviewing others. Additionally, I chose not to interview some groups because I felt that they could have seen me watching them while they fed the deer, because I happened to be sitting near them. Therefore, only 15 of 27 control groups were interviewed. Seven of these groups did not feed the deer and 8 had at least one individual who fed deer. Because the sample size is so small, the interviews will not be systematically analyzed, but they will be used to enhance understanding of the findings from the survey and behavioral observations.

Although deer came into the picnic area nearly every day the researcher was present, there were many days (8 out of 21) when the deer were chased from the picnic area by enthusiastic children or scared away by dogs before they had the opportunity to approach any picnickers. There were several doe that frequented the picnic area, often more than once a day, and they sometimes brought their fawns. When not chased off by children, the deer tended to approach picnickers. Their behavior (head lowered and bobbing up and down) clearly indicated to the visitor that they were begging for food. The deer were also observed to go from table to table seeking handouts.

Table 2. Picnic area observations.

Treatment	# of observations (group)	# of days observed	Total # of hrs observed
Control	27	13	46
Moral	16	5	29
Fear	18	3	20
Total	61	21	95

Visitor characteristics

A slightly higher percentage of the surveys in the campground were completed by females (51.7%) than males (48.3%). There was no significant difference in gender proportions among treatments (Table 3). The average age of survey respondents was 37.6 years. The youngest respondent was 16 years old and the oldest was 80 years old. There was no significant difference between treatments in age of respondents (Control: 0=39.0, Moral: 0=36.2, Fear: 0=37.6 years).

Table 3. Gender proportions for each treatment.

Gender	Control (n=108)	Moral (n=110)	Fear (n=113)
Male	47.2%	50.9%	46.9%
Female	52.8	49.1	53.1

Campground visitors were generally well educated, with 87% having attended at least some college (Table 4). Twenty-five percent of survey respondents had completed an advanced degree. There was no significant difference in education level among treatments. Similar levels of education were found among backcountry and wilderness hikers in SNP, with 92% reporting they had attended at least some college (Hockett and Hall 1999). Education level was not assessed for picnickers.

Table 4. Education level of campground visitors.

Highest level of education	Control (n=109)	Moral (n=113)	Fear (n=116)
Some high school	0.9 %	3.5 %	1.7 %
High school diploma	13.8	10.6	7.8
Some college	27.5	23.9	24.1
Bachelor's degree	30.3	38.1	41.4
Master's degree	22.9	15.0	21.5
Ph.D., M.D., J.D., or equivalent	4.6	8.9	3.5

The majority of campground visitors (78%) had previously visited Shenandoah National Park (Table 5). There was a difference in number of times respondents had visited SNP among treatments (Chi-square, $p=0.005$). Fewer people receiving the fear appeal intervention had been to SNP before, than among those receiving the moral appeal or control treatments. The moral appeal treatment surveyed more people who had visited SNP a great deal (over 20 times). The control treatment group was intermediate in visitation history. There is no obvious reason for the differences in past experience among treatments. There were no holiday weekends included in the sample, and all weekends were during summer break for school-aged children. One possible explanation for a greater number of visits for the moral appeal group could be that this treatment was administered the last weekend of the study (August 13-15) and it is possible that more local visitors were present in the sample because summer break was near an end and people were no longer traveling long distances. Because of these differences, analysis of the relationship between past experience and other measures will be conducted.

Table 5. Number of previous trips to Shenandoah National Park.¹

Number of previous trips to SNP	Control (n=104)	Moral (n=112)	Fear (n=114)
None	21.1 %	14.3 %	30.7 %
1-5	32.7	42.9	42.1
6-10	16.4	12.5	12.3
11-15	7.7	4.5	6.2
16-20	5.8	1.8	2.6
21+	16.3	24.1	6.1

¹ 10 individuals were not included because they gave a non-numerical response (e.g., a lot, many, too many to count).

Importance and benefits of deer to trip experience

For the majority of visitors, wildlife viewing was an important part of their trip to SNP, although few (9 to 12%) said it was their primary reason for coming to the Park (Table 6). No one indicated disliking wildlife, and only 0.9% (1 individual) indicated that wildlife viewing was not at all a part of their visit to SNP. A Chi-square analysis could not be conducted on the complete data set to test for differences among the treatments because the last two categories produced cells that had expected counts less than 5. Therefore, the last two categories were removed for the analysis. The resulting Chi-square test indicated that there was no significant difference among the treatments.

Table 6. Role of wildlife viewing in trip(s) to SNP.

Role of wildlife viewing	Control (n=107)	Moral (n=114)	Fear (n=117)
It is my primary reason for coming to the park. I plan hikes and drives to maximize my chances of seeing wildlife.	12.2%	8.8%	12.0%
It is an important part of my visit. I stop and watch wildlife when I see it.	71.0	68.4	68.4
It is not a very important part of my visit, but I enjoy seeing wildlife.	15.9	22.8	19.6
Wildlife viewing is not a part at all of my visit to SNP.	0.9	0.0	0.0
I dislike wildlife and try to avoid it.	0.0	0.0	0.0

In addition to asking the importance of wildlife viewing to their trip to SNP, campers were asked several questions to characterize the potential benefits they received while observing deer in SNP. Respondents indicated on a 5-point Likert-type scale (-2 to +2) their level of agreement with each benefits statement. The scale was then collapsed into three categories: disagree (-2, -1), neutral (0), and agree (1, 2).

In order to understand how typical SNP visitors (i.e., not influenced by the moral and fear appeals) feel about deer, only responses from the control group were considered. In general, a sizeable majority of respondents agreed that they received benefits from seeing deer in SNP (Table 7). For example, the presence of deer enhances the feeling of naturalness, and seeing deer up close gives most visitors a thrill and helps them learn about the deer and feel closer to nature. The visitors may not gain such benefits from seeing deer confined in a zoo environment, because a vast majority (92%) indicated that they would rather see wild deer than deer in zoos.

Table 7. Benefits of watching deer in SNP (n=107).

Benefit	Mean ¹	% Agree	% Neutral	% Disagree
The park feels more natural when deer are around.	1.6	96.3	2.8	0.9
SNP feels more like wilderness when I see deer in the campground.	0.9	75.9	7.4	16.7
I get a thrill when I see deer up close.	1.3	83.2	11.2	5.6
I'd rather see wild deer at SNP than deer kept in zoos.	1.6	91.7	3.7	4.6
Watching deer up close helps me learn about nature.	1.1	88.9	6.5	4.6
Getting close to deer helps me feel closer to nature.	1.0	76.9	12.0	11.1

¹The respondents selected their level of agreement on a 5-point Likert-type scale (-2 to +2). The scale was then collapsed into three categories: disagree (-2, -1), neutral (0), and agree (1, 2).

Deer densities are relatively high in the Big Meadows area (Rolf Gubler, personal communication). This is reflected in the large number of deer that respondents reported seeing while on their trip to SNP. More than 50% of all campers reported seeing more than 11 deer, and 8.5% reported seeing more than 30. A surprisingly small percentage (0.6%) reported seeing no deer prior to the survey.

Table 8. Number of deer seen in SNP at the time the survey was administered (n=341).

Number seen	Percent
None	0.6
1-10	46.3
11-20	31.4
21-30	13.2
31+	8.5

General opinions on deer feeding

The majority (85%) of Park visitors not exposed to the moral and fear appeals strongly believed that Park managers should prohibit visitors from feeding deer, and very few (5.7%) disagreed (Table 9). The vast majority also agreed that they would rather see wild deer than deer that were fed, and it bothered them to see others feeding deer. The mean response to these items also suggests that visitors feel strongly that deer in the park should not be fed.

Table 9. General opinions on deer feeding in SNP (n=109).

Opinions on deer feeding	Mean ¹	% Agree	% Neutral	% Disagree
It bothers me to see people feeding deer.	1.4	85.3	5.5	9.2
Park managers should prohibit visitors from feeding deer.	1.6	89.6	4.7	5.7
I'd rather see wild deer than fed deer.	1.5	86.2	12.8	0.9

¹The respondents selected their level of agreement on a 5-point Likert-type scale (-2 to +2). The scale was then collapsed into three categories: disagree (-2, -1), neutral (0), and agree (1, 2).

Messages seen on deer feeding in SNP

Even in the control situation, a relatively large percentage (72%) of visitors reported seeing at least one message on feeding or approaching deer in SNP. Significantly more campers reported seeing a message on deer feeding in the treatment conditions (88 and 89%) (Chi-square, $p=0.001$). Respondents, who reported seeing a message, were then asked in an open-ended question to indicate where they had seen the information. In the control condition the most frequently mentioned messages seen were signs along Skyline Drive and at the entrance to Big Meadows and the campground (Table 10). During the treatments, the most frequently mentioned messages seen were the interventions on the campsite picnic tables (Fear appeal: 40%, Moral appeal 54%), followed by the signs along Skyline Drive. Moral appeal respondents were more likely to report seeing the treatment signs on the picnic tables (Chi-square, $p=0.027$) and less

likely to report seeing the signs along Skyline Drive (Chi-square, $p=0.006$) than the fear appeal group.

Although the signs on the picnic table were the most frequently mentioned, they were clearly not seen by all campers or at least not remembered. This could be due in part to campers placing tablecloths on the tables before all members of the group had a chance to observe the signs. On the other hand, open-ended questions always have problems of recall; if respondents saw the message and did not recall doing so, this suggests something about the saliency of the message. If saliency and not message exposure determined reporting of message location, the results suggest that the moral appeal message was more likely to be recalled than the fear appeal and the moral appeal tended to override the memory of the roadside signs.

Table 10. Location of messages on feeding deer seen by campers. (The percentages given are of the entire number of people in the control and treatment conditions. Some respondents indicated more than one location.)

Location of message	Control	Moral	Fear
At campsite/on table	1.1%	54.1%	40.4%
Road signs along Skyline Drive	21.7	9.0	21.3
At campground/Big Meadows entrance	15.2	3.3	3.6
Campground (registration booth, bathrooms, regulations)	5.4	7.4	6.4
Fliers, brochures, Overlook	6.5	6.6	0.7
All over, everywhere, several places	7.6	3.3	5.0
Stated saw sign that said not to feed but did not give location	15.2	4.9	3.6
Campground (unspecified location)	8.7	1.6	4.3
On signs (unspecified location)	6.5	1.6	4.3
Ranger programs/rangers	2.2	0.8	2.1
Trailheads	1.1	2.5	0.7
Can't remember	2.2	1.6	1.4
Ranger station	1.1	0.8	2.1
Total percentage seeing any message	72.0	87.5	88.8

Influences of interventions on attitudes about deer

Fear appeal: specific items from intervention

In order to detect whether reading the fear appeal altered attitudes or beliefs about the dangers of deer to humans, four items were developed directly from the main points stated in the intervention. Respondents were asked how strongly they agreed or disagreed with each statement on a 5-point Likert-type scale. For all four statements, the respondents who had received the fear appeal were significantly more likely than either control or moral appeal recipients to agree that deer pose a danger to people who got too close to them (Table 11). The control and moral appeal respondents were never

significantly different from each other in their beliefs about the dangers posed by deer being close to people.

Although the campers in the fear appeal were more likely to agree that deer could be a danger to people, the strength of agreement was not always great. On average, campers only slightly agreed that people could give people diseases if they got too close (0=0.2). There was also a relatively low level of agreement that deer could gore people with their antlers if they got too close (0=0.5). More people agreed that deer could kick people (0=0.8) or bite them (0=1.0).

Table 11. Mean responses of visitors to statements taken directly from the fear appeal.¹

Fear appeal statement	Control (n=107- 108) ²	Moral (n=111- 114)	Fear (n=117- 118)	p-value ³
Deer sometimes give people diseases if they get too close.	-0.3 ^a	-0.3 ^a	0.2 ^b	0.001
Deer sometimes gore people with their antlers if they get too close.	-0.2 ^a	-0.1 ^a	0.5 ^b	<0.0005
If people get too close to them, deer sometimes kick people.	0.2 ^a	0.3 ^a	0.8 ^b	0.001
Deer could bite if people get too close.	0.1 ^a	0.4 ^a	1.0 ^b	<0.0005

¹ Means based on a 5-point Likert-type scale from -2 (strongly disagree) to +2 (strongly agree).

² Sample size varied slightly by question item.

³ ANOVA, with Tukey-Kramer post-hoc pairwise comparisons (p<0.05).

Fear appeal: survey items related to the intervention

In addition to the survey items directly related to the intervention, respondents were asked to indicate their level of agreement with a number of other statements related to the danger of deer-human interactions. Although respondents receiving the fear appeal were more likely to evaluate deer as a threat, they were just as likely as people in the other two treatments to strongly disagree with the statement that they were scared of deer (Table 12). Control and moral treatment visitors were neutral in their responses to

the statement that it was unlikely that a deer would hurt them if they tried to feed it (0=0.0). Visitors who received the fear appeal disagreed with this statement significantly more than the other two treatments, although the level of disagreement was fairly weak (0= -0.5). Consistent with their general lack of fear of deer, all visitors believed that it was unlikely that a deer could be dangerous, unless they tried to touch it. However, there was more concern by those receiving the fear appeal that having deer too close could endanger small children (0= 0.4). These findings suggest that the fear appeal changed specific, targeted cognitions, but had somewhat less of an effect on overall fear-related cognitive structures.

Table 12. Mean responses of visitors to statements related to the fear appeal.¹

Fear-related statement	Control (n=106-109) ²	Moral (n=111-115)	Fear (n=115-118)	p-value ³
I am scared of deer.	-1.6	-1.7	-1.6	ns
It is not very likely that a deer would hurt me if I tried to feed it.	-0.0 ^a	-0.0 ^a	-0.5 ^b	0.002
A deer that approaches people for food is unlikely to behave aggressively.	-0.2	-0.4	-0.6	ns
As long as you don't try to touch them, deer aren't very dangerous.	1.2	0.9	1.1	ns
Having deer too close can endanger small children.	-0.3 ^a	0.0 ^a	0.4 ^b	<0.0005

¹ Means based on a 5-point Likert-type scale from -2 (strongly disagree) to +2 (strongly agree).

² Sample size varied slightly by question item.

³ ANOVA, with Tukey-Kramer post-hoc pairwise comparisons (p#0.05).

Moral appeal: specific items from intervention

The only survey item to which the campers receiving the moral appeal responded differently from the other two groups was that they agreed more strongly that human food could make deer sick (Table 13). All SNP visitors strongly agreed with the statements in the moral appeal about the negative impact feeding has on deer, whether they had received the moral appeal or not. They agreed that fed deer would lose their

ability to find natural foods and that feeding increased the risk of a deer getting hit by a car or shot by a hunter. They also did not believe that feeding deer helped them to avoid predators. These results suggest that SNP visitors are aware of the negative consequences to deer when they are fed.

Table 13. Mean responses to items taken from the moral appeal.¹

Moral appeal - items from intervention	Control (n=107- 109) ²	Moral (n=110- 113)	Fear (n=115- 116)	p-value ³
People should not feed deer because they will lose their ability to find natural foods.	1.5	1.5	1.5	ns
Human food could make deer sick.	1.3 ^{ab}	1.5 ^a	1.1 ^b	0.009
Deer that are fed are more likely to get hit by cars.	1.0	1.0	0.8	ns
Deer that are fed are more likely to get shot by hunters.	1.1	0.9	1.0	ns
Feeding deer helps them to avoid predators.	-1.3	-1.5	-1.3	ns

¹Means based on a 5-point Likert-type scale from -2 (strongly disagree) to +2 (strongly agree).

² Sample size varied slightly by question item.

³ ANOVA, with Tukey-Kramer post-hoc pairwise comparisons ($p < 0.05$).

Moral appeal: survey items related to the intervention

As with the survey items directly from the intervention, there were no significant differences between those who received the moral appeal and those who did not in their responses to statements related to the moral appeal (Table 14). Visitors in all treatments seemed to be knowledgeable about the negative effects of even one person feeding deer. Respondents strongly agreed that fed deer were more likely to eat garbage. They also disagreed with the statement that it was OK to feed deer natural foods. These responses again suggest that SNP visitors recognize the negative consequences of feeding for the deer.

Table 14. Mean responses to items related to the moral appeal.¹

Moral-related statement	Control (n=108- 109) ²	Moral (n=112- 113)	Fear (n=115- 116)	p-value ³
Fed deer are more likely to eat garbage.	1.4	1.4	1.3	ns
It is OK to feed deer natural foods like wild apples, grass, or acorns.	-0.9	-0.9	-0.9	ns
One person feeding deer doesn't really make a difference.	-1.3	-1.3	-1.2	ns

¹Means based on a 5-point Likert-type scale from -2 (strongly disagree) to +2 (strongly agree).

² Sample size varied slightly by question item.

³ANOVA

Effects of past experience in SNP

While not a primary focus of this research, it was necessary to determine whether past experience in SNP influenced how visitors responded to survey questions, because there was a significant difference among treatments in number of past trips to SNP. As discussed previously, a greater proportion of the respondents in the fear treatment were first time visitors to SNP than in either the control or moral treatments (see Table 5). For the purposes of the analysis the six trip categories reported in Table 5 were reduced to three categories (0 trips, 1-5 trips, and 6+ trips) (Table 15). Only control group responses were included in the analysis.

Table 15. Number of previous trips to Shenandoah National Park.¹

Number of previous trips to SNP	Control (n=103)	Moral (n=112)	Fear (n=114)
None	21.1 %	14.3 %	30.7 %
1-5	32.7	42.9	42.1
6 or more	46.2	42.8	27.2

¹ Chi-square all three groups, p= 0.007, Chi-square fear vs. moral appeal groups, p=0.005, Chi-square fear vs. control groups, p=0.017, Chi-square moral vs. control groups, ns.

General opinions on deer feeding

There were no significant differences in responses to general questions about deer feeding among visitors with different levels of experience in SNP (Table 16). However, there was an interesting trend, with more experienced SNP visitors tending to be bothered more by visitors feeding deer and more supportive of the Park prohibiting deer feeding.

Table 16. Mean level of agreement on deer feeding by number of previous trips to SNP.¹

Opinions on deer feeding.	0 trips (n=22)	1-5 trips (n=33-34) ²	6+ trips (n=46-47)
It bothers me to see people feeding deer.	1.0	1.5	1.4
Park managers should prohibit visitors from feeding deer.	1.1	1.6	1.7
I'd rather see wild deer than fed deer.	1.2	1.6	1.5

¹Means based on a 5-point Likert-type scale from -2 (strongly disagree) to +2 (strongly agree)

² Sample size varied slightly by question item.

Fear appeal items

There were no significant differences in level of agreement with items taken directly from the fear appeal among visitors who had made different number of trips to SNP (Table 17). Although insignificant statistically, there appears to be a slight trend that more inexperienced users tended to be less likely to think that deer would hurt them. Because the fear appeal treatment contained a higher percentage of novices than the control and moral appeal groups, this trend would have worked against the effectiveness of the fear appeal. Therefore, any observed increase in beliefs that deer could be dangerous under the fear appeal treatment would not have been enhanced by the distribution of experience levels.

Table 17. Mean responses of visitors to statements directly from and related to the fear appeal by number of previous trips to SNP.¹

Fear appeal item	0 trips (n=20-22) ²	1-5 trips (n=32-34)	6+ trips (n=45-47)
Deer sometimes give people diseases if they get too close.	-0.6	-0.1	-0.5
Deer sometimes gore people with their antlers if they get too close.	-0.4	-0.3	-0.1
If people get too close to them, deer sometimes kick people.	0.0	0.0	0.4
Deer could bite if people get too close.	0.0	0.1	0.2
I am scared of deer.	-1.7	-1.5	-1.7
It is not very likely that a deer would hurt me if I tried to feed it.	0.5	-0.1	0.0
A deer that approaches people for food is unlikely to behave aggressively.	0.3	-0.3	-0.3
As long as you don't try to touch them, deer aren't very dangerous.	1.5	1.3	1.1
Having deer too close can endanger small children.	-0.4	-0.5	0.2

¹ Means based on a 5-point Likert-type scale from -2 (strongly disagree) to +2 (strongly agree)

² Sample size varied slightly by question item.

Moral appeal items

There were significant differences between experience level in 2 of the 5 items taken directly from the moral appeal (Table 18, top 5 items). People with an intermediate level of past use (1 to 5 trips) or experience in SNP were more likely to indicate that fed deer were more likely to get hit by cars and they were less likely to agree that feeding deer helps them avoid predators. This difference should not have affected the outcome of the ANOVAs among treatments on each question item (Table 13) however, because responses of the novice and experienced visitors were not significantly different. Therefore, the relatively high number of novices in the fear appeal should have responded similarly to the relatively high percentages of experienced

visitors in the moral and control groups. There were no other significant differences among experience levels in the other moral appeal related items.

Table 18. Mean responses to items taken from and related to the moral appeal by number of previous trips to SNP.¹

Moral appeal items	0 trips (n=22)	1-5 trips (n=33-34) ²	6+ trips (n=46-47)	p-value ³
People should not feed deer because they will lose their ability to find natural foods.	1.0	1.6	1.5	ns
Human food could make deer sick.	1.1	1.3	1.3	ns
Deer that are fed are more likely to get hit by cars.	0.5 ^a	1.3 ^b	0.9 ^{ab}	0.037
Deer that are fed are more likely to get shot by hunters.	0.8	1.2	1.1	ns
Feeding deer helps them to avoid predators.	-0.9 ^a	-1.6 ^b	-1.4 ^{ab}	0.017
Fed deer are more likely to eat garbage.	1.2	1.6	1.4	ns
It is OK to feed deer natural foods like wild apples, grass, or acorns.	-0.3	-1.1	-0.9	ns
One person feeding deer doesn't really make a difference.	-1.0	-1.5	-1.2	ns

¹Means based on a 5-point Likert-type scale from -2 (strongly disagree) to +2 (strongly agree)

² Sample size varied slightly by question item.

³ ANOVA, with Tukey-Kramer post-hoc pairwise comparisons (p<0.05)

Experience summary

Only two moral appeal items showed a significant difference with past experience to SNP, with the group who had taken an intermediate number of trips being significantly different in their responses. All three groups contained a very similar percentage of visitors in the intermediate level (33 to 43%), so this suggests that any differences would not have influenced the outcome of the other analyses. Also, only two significantly different question items out of 20 would not be very unusual based upon chance alone. Therefore, the general conclusion from the analyses of the moral

and fear appeal items suggest that past experience is unrelated to the dependent measures.

Behavioral observations

Campground observations

Observations were made of campers interacting with deer in their campsites. The behavior of the deer as well as the behavior of the visitor was recorded. Behavioral data were collected for each adult in the campsite at the time the deer was present. In all cases, the deer were observed to be grazing when they entered and moved through a campsite. Although approached by visitors frequently (Table 19), the deer typically continued grazing or slowly moved away. Deer spooked and bolted from the campsite on only two occasions when they were approached by a visitor.

The campground visitor observations resulted in some interesting and unexpected trends in behaviors in the different treatments. It was curious that the control group was observed to ignore the deer more than the visitors receiving the moral and fear appeals (Chi-square, $p=0.014$) (Table 19). Thus, it appears that the interventions may have drawn attention to the deer, which was also indicated by the much greater percentage of visitors in the moral and fear appeals who watched the deer (Chi-square, $p<0.0005$). Surprisingly, in addition to appearing to draw attention to the deer, the fear appeal also appeared to increase more involved interactions with the deer. Although the fear appeal stated that visitors should not try to approach deer, visitors in the fear appeal treatment tended to approach and follow a deer if it moved away more than people in the control and moral appeal treatments, although there was not a statistical difference (Table 19). In addition, the only person who was observed feeding a deer (a bun) in the campground received the fear appeal. Although there was not a significant difference, it was also interesting that visitors in the moral appeal treatment were the most likely to simply watch the deer and not attempt to approach or follow the animal, even though the moral appeal message did not mention anything about not approaching deer. While these findings suggest some unexpected effects from the interventions (i.e., an increase in approaching and following deer with the fear appeal), it

should be kept in mind that the sample sizes were small enough that there was a greater likelihood of chance events influencing the results.

Table 19. Observed behaviors of campground visitors when deer were in their campsites.¹

Behavior	Control % (n=20)	Moral % (n=17)	Fear % (n=27)	p-value ²
Ignore	60.0 ^a	23.5 ^b	22.2 ^b	0.014
Watch	40.0 ^a	88.2 ^b	96.3 ^b	<0.0005
Approach	30.0	17.6	44.4	ns
Follow	15.0	5.9	25.9	ns
Photograph	15.0	11.8	37.0	ns
Feed	0.0	0.0	3.7	–

¹ The percentages in each column will not add up to 100% because each individual could have performed several behaviors while he or she was being observed. For example, a person could have watched deer, approached them and taken a photograph, and then returned to his or her previous activity and ignored the deer, while it was still in his or her campsite.

² Chi-square tests were used for all comparisons.

Another behavioral measure of visitor interactions with deer was how close they were from the deer. While observing each interaction, the researcher estimated the closest distance that occurred between the deer and the visitor. In many cases the distance was shortened by the people approaching the deer (see Table 19), but often the people simply watched a deer as it moved through their campsite, and the deer actively controlled the distance between them. However, no one was ever observed moving away from a deer to create greater distance.

Surprisingly, but consistent with the behavioral observations presented above, people in the fear appeal were much more likely to be within 5 yards of deer than were visitors in the control and moral treatments (Chi-square, $p=0.004$) (Table 20). Visitors who were exposed to the moral appeal were the least likely to be seen within 5 yards of

a deer. There was not a significant difference between males and females in their observed distances from deer.

Table 20. Closest distance observed between deer and visitor. ¹

Distance	Control (n=20)	Moral (n=17)	Fear (n=27)
#5 yards	30.0%	6.6%	65.4%
6-10 yards	40.0	46.7	15.4
10+ yards	30.0	46.7	19.2

¹ Chi-square (all three groups), $p=0.004$; Chi-square (moral appeal vs. control), ns; Chi-square (fear appeal vs. control), $p=0.05$; Chi-square (moral vs. fear appeals), $p=0.001$.

Picnic area observations

Observations were made in the picnic area of the reaction of groups to deer moving through their area in the picnic grounds. An interaction was considered to occur when a deer moved within 10 yards of a group's picnic table. A group was recorded as feeding the deer if at least one person in the group fed the deer.

Under control conditions, a surprisingly high percentage of groups (63%) fed deer in the picnic area (Table 21). It is unclear why such a high percentage of visitors to the picnic area fed the deer, when only one camper was observed feeding a deer. One possibility is that food was more available to visitors in the picnic area. However, food was also available to campers, although it was not often out on the table when deer were around. Another possibility is differences in deer behavior. Deer in the campground acted unafraid of people, while they were in campsites grazing, but they did not approach visitors and beg for food. Deer in the picnic areas were clearly begging for food and initiated interactions by approaching visitors. Another possibility is that campers and picnickers are different groups.

The moral and fear appeals both reduced the percentage of groups feeding deer in the picnic area, with the moral appeal being the most effective (Table 21). Only 25% of groups fed the deer while the moral appeal was posted. This is consistent with the findings from the campground behavioral observations with the moral appeal reducing approaching behavior by visitors and increasing the distance between deer and people.

Table 21. Percent of groups with at least one member who fed deer in the picnic area.¹

Behavior	Control (n=27)	Moral (n=16)	Fear (n=18)
Fed	63.0%	25.0%	38.5%
Did not feed	37.0	75.0	61.5

¹ Chi-square (all three groups), p=0.042; Chi-square (moral appeal vs. control), p=0.016; Chi-square (fear appeal vs. control), ns; Chi-square (moral vs. fear appeals), ns.

It is also important to note that of the 4 groups that fed deer in the moral appeal treatment, two groups fed a deer leaves off of a tree, which they had observed the deer eating previously. Another feeder was a child who tossed the deer a part of his sandwich after being told not to by his parents. Therefore only 1 group out of the 16 observed in the moral appeal contained an adult who fed the deer table food. In contrast, 7 of 9 feeder control groups and 3 of 5 feeder fear treatment groups were known to have fed deer table food. (These results are only for those groups of which I could determine what had been fed to the deer. Often, I was only close enough to see people tossing something and the deer walking over to pick something off of the ground.)

Favorite food items to feed deer

Out of 29 feeding observations made in the campground and picnic areas it was possible to observe what was fed 18 times. The majority of the food given to deer was human food taken from the table (66.7%). The most common items offered deer were chips and bread. Several interviewed visitors commented that the deer liked the salt on

the chips. The rest of the time (33.3%) visitors attempted to feed the deer more “natural” foods such as acorns, grass, leaves, and fern.

Unintended effects of interventions

The apparently different effect of the fear appeal between the campground and the picnic area was unexpected and difficult to explain. While the fear appeal reduced feeding in the picnic area, it appeared to increase watching, approaching and following behavior in the campgrounds (Table 19). It was also unexpected that the moral appeal would decrease approaching and following behavior in the campground because the message did not contain instructions not to approach wildlife as were contained in the fear appeal. Campground behavioral observations also suggested that both appeals attracted additional attention to the deer.

In addition to the unexpected effects on behavior, the appeals also changed attitudes about seeing deer. The moral appeal appears to have had a negative effect on the experience of seeing deer in SNP. Apparently, the message tone of the moral appeal, which suggested that deer were seeking handouts from visitors, detracted from the experience of seeing deer in SNP (Table 22). Moral appeal visitors were less likely than the control group to agree that the park feels more natural when deer are around. They were also more likely than either the control or fear appeal groups to say that it bothered them to see deer that were unafraid of people. These results suggest that the moral appeal detracted from the experience of seeing deer in SNP, which was not intended and may not be a desirable effect of the message.

Table 22. Mean responses to benefits of watching deer in SNP.¹

Benefit	Control	Moral	Fear	p-value ²
The park feels more natural when deer are around.	1.6 ^a	1.3 ^b	1.4 ^{ab}	0.024
SNP feels more like wilderness when I see deer in the campground.	0.9 ^a	0.5 ^b	1.0 ^a	0.002
I get a thrill when I see deer up close.	1.3	1.1	1.1	ns
I'd rather see wild deer at SNP than deer kept in zoos.	1.6	1.6	1.7	ns
Watching deer up close helps me learn about nature.	1.1 ^a	0.8 ^b	1.0 ^{ab}	0.017
Getting close to deer helps me feel closer to nature.	1.0	0.7	1.0	ns
It bothers me to see deer that are unafraid of people.	0.0 ^a	0.5 ^b	-0.1 ^a	0.001

¹ Means based on a 5-point Likert-type scale from -2 (strongly disagree) to +2 (strongly agree)

² ANOVA, with Tukey-Kramer post-hoc pairwise comparisons (p<0.05)

DISCUSSION

Assumptions

Although the differences in behavior between campers and picnickers were surprising, there is not enough information available to conclude that these groups come from two different populations. Therefore, for the purposes of this discussion I am assuming that campers (attitude study) and picnickers (behavior study) are from the same population. Most of the behavior discussion below focuses on the picnic area because that is where the greatest number of feeding incidents were observed, which was the target behavior of the interventions. The differences in camper and picnicker populations suggest the need for further research to determine whether the results were due to differences in visitor populations or deer populations.

General perceptions of deer in SNP

Clearly, viewing deer is an important part of many visitors' trips to Shenandoah National Park. The vast majority of visitors (77-83%) indicated that wildlife viewing was an important part of their trip and that they stopped and watched wildlife when they saw it. Several groups who were interviewed indicated that watching and getting close to the deer in SNP was their primary reason for coming into the Park. For instance, one visitor stated that she liked that "... you can get close and not spook them. That's why we come down." Presence of deer makes the park seem more natural to most visitors (96%), and most (83%) also reported getting a thrill when they saw deer up close.

A substantial number of visitors indicated that being able to get close to deer was an important part of what they liked about the deer in Shenandoah. When asked what they liked most about the deer in SNP, 79% of the groups interviewed (n=28) mentioned something about the tameness of the deer and being able to see them up close. Some example responses were:

"That they come to you and you can pet them."

"They are friendly and you can get up close to them and have a good look at them."

"Oh, I like it that they like me."

“That they’re tame.”

“That they are not too part of the wild. They’re pretty tame.”

“Their lack of fear of people, just them wandering around and they check you out and they’re not afraid.”

“They’ll come up and eat off your table. I’ve been here when they’ve done that.”

One respondent clearly articulated an understanding of why the deer were so tame by stating, “They have become conditioned... obviously they are not afraid of the general public, and so they’ll get a lot closer than they will in most other environments.”

While park managers should be happy that seeing deer up close is providing an extremely positive experience for many visitors, the example responses given above suggest that the attitudes of visitors toward deer could lead to negative interactions between deer and humans. As indicated by interviews under control conditions, visitors clearly saw the deer as friendly, tame, and less wild, with one person even suggesting that visitors can pet them. This suggests that Park visitors do not see deer as potentially dangerous, wild animals that could injure them if they got too close. These perceptions may be in part because it appears to many visitors that deer initiate interactions with visitors by approaching people and even taking food off picnic tables. Visitors may be misinterpreting the apparent lack of fear or aggressive behavior by the deer as being a signal that it is safe to get close to them.

The absence of comments from visitors suggesting that they are uncomfortable with having a wild animal so close to them is additional evidence that thoughts about negative aspects of getting close to wildlife are not a part of visitors’ schema about Park deer, or if they are a part of their attitudes about deer, they were not salient concepts. When asked if there was anything that they disliked about the deer in SNP, most (83%) adamantly said “nothing,” and no one mentioned that they disliked or felt uncomfortable with the deer being close to them.

Another interesting feature of the perceptions of deer by visitors is that, although the interview responses clearly suggested that visitors recognize that it is unusual (i.e.,

not typical or normal deer behavior) for deer to be so tame or unafraid of people, survey respondents felt that the close proximity of the deer made the park feel more “natural.” Most (76%) even agreed with the statement that SNP seemed more like wilderness when they saw deer in the campground. These views seem counterintuitive (unless wilderness is seen as a “Garden of Eden” and pastoral).

Effectiveness of interventions in changing attitudes

Moral appeal

The moral appeal was unsuccessful in changing attitudes about the negative impacts to deer from feeding. This was undoubtedly due to the finding that visitors were already relatively knowledgeable about the negative impacts to deer. All treatment groups agreed fairly strongly (0=1.5) that feeding deer would cause them to lose their ability to find natural foods and that human food could make deer sick (0 = 1.1-1.5). Visitors also agreed that deer that are fed are more likely to get shot by hunters or hit by cars. The lack of significant attitude change suggests that those who already held similar attitudes maintained them, but there was no increase in attitude strength or increase in percentage of visitors with those attitudes.

The interviews conducted in the fall of 1998 and the summer of 1999 also support the finding that SNP visitors are well-informed about the negative consequences to the deer from being fed by visitors. Consistent with the strong agreement with the statement about deer losing their ability to find natural foods, when asked why feeding deer should be discouraged in the Park, the majority of groups interviewed (21 of 28, or 75%) mentioned specifically (without prompting) a concern that deer would become dependent on people and lose their ability to find natural food. Linked to this concept was the fear that deer would starve in the winter when there were no picnickers or campers in the Park to feed them. Surprisingly, feeders were as likely as non-feeders (71%) to express concerns about this issue. Some example quotes follow that illustrate the concerns about deer becoming dependent on people. Quotes from feeders are marked with an ^F and non-feeders with an ^{NF}.

“Because it lessens their natural ability to take care of themselves.”^F

“People aren’t up here in the winter to feed them, they’ll die when we have a bad winter.”^F

“They get used to eating from your hand and then they won’t fend for themselves...they will depend on you.”^F

“They get dependent on people feed’n them and they wouldn’t know how to feed themselves when there was nobody here.”^F

“To a degree it probably might cause them to lose some of their natural instincts, so that they might get hungry in the winter when they uh... when there is no one around. Yeah, then they could go hungry, because they will lose their natural instincts to eat off the land.”^{NF}

“Because then they don’t learn how to feed themselves and how to get food on their own. And in the winter they’ll die because they can’t find food.”^{NF}

“Because it disrupts the natural selection process, the Darwinian, the good deer forage for their food and survive, bad deer die. Strong deer, weak deer.”^{NF}

“Because it interrupts the natural way things should be, ‘cause then they become too tame and they, uh, can’t get [food] on their own. If the people leave, especially after this season, and people aren’t around anymore and they have become dependent to feed them then they can’t survive on their own.”^{NF}

Many interviewed visitors (50% of groups) also had concerns that human food could make deer sick. As with concerns about deer losing their natural ability to find food, feeders were just as likely as non-feeders to express concerns about the types of foods people fed deer. While people seemed concerned about the types of foods fed to the deer, there was some disagreement about what was appropriate. Some thought that it was OK to feed them natural foods like berries and grass, while others thought that apples and fruit were healthy. Some recognized that foods such as marshmallows and meat were bad, but others felt that chips were acceptable because the deer liked the salt. The following responses were to the question asking why feeding should be discouraged or why feeding was not OK.

“I don’t know if they’d be able to adjust to some of the food people fed them. They might not be what they are, you know, used to.”^{NF}

“Probably some of the stuff you feed them isn’t good for them. I guess they’re probably not meant to eat Twinkies and Lays potato chips....I could see some kid giving them like a Slim Jim and messing their digestion up for a month.”^{NF}

“Because they say it hurts their digestive system. I think that’s what I’ve always read.”^F

“It’s not healthy to a deer..got better stuff to eat than we give them. White bread ain’t no good. For instance, I mean, the deer that eat a lot of the stuff that people eat are skinny and they ain’t healthy.”^F

“Because some will probably do it, and do it right and give them things that might be good for them like uh, grapes or apples, fruit. Others will give them french fries and potato chips and things that aren’t healthy.”^F

Some respondents clearly felt that feeding deer was acceptable if people fed them things that did not harm them. There was great concern about deer health, and people clearly did not want to hurt the deer by feeding them. These attitudes suggest that a moral appeal should be an effective way to reduce deer feeding because people should want to help the deer and not hurt them. Many feeders were clearly rationalizing feeding deer because they thought that they were feeding them something that was not harmful for the deer to have, but at the same time they felt that feeding should be prohibited because not everyone knew what was safe to feed deer. The following quotes are illustrative of these attitudes.

“Well, if people were responsible and if they know the right thing to feed them...yeah, I worry about the salt, whatever, lots of chips or something. Wouldn’t want anything to happen to them...feed something that might hurt them. Some people might unknowingly give them the wrong thing.”^F

“Well, you wouldn’t want to do harm to them.”^F

The moral appeal attempted to build on these feelings of caring for and not wanting to harm the deer by explaining that even if the food that was fed to deer was healthy, there were other negative consequences from changing deer behavior, such as susceptibility to poachers or hunters and dangers from getting too close to cars. Although a few visitors mentioned during interviews the fear that deer which are unafraid of people could get shot more easily, no one mentioned increased chance of

deer-vehicle collisions as a reason not to feed deer. Therefore, these concepts were not salient to visitors, although survey results indicated that visitors tended to agree that hunters and cars were higher risks to fed deer than unfed deer.

Fear appeal

Unlike the persuasive arguments presented in the moral appeal, arguments in the fear appeal were not very salient or part of visitors' schemas about deer. Responses to the interviews suggested that visitors simply did not consider deer as posing a potential danger to themselves. When asked to state reasons why visitors should not feed deer, only 3 out of the 28 interviewed groups mentioned that deer could injure people. Clearly, the potential for aggressive behavior by the deer was not a salient reason for not feeding deer. When describing the deer in SNP many visitors used words such as "tame," "gentle," "passive," "cute," and "pretty," which suggests that visitors perceive deer in a way that would be contrary to ideas about a wild animal that could injure them. Others also mentioned that deer were herbivores and prey for other animals, therefore they did not have teeth or sharp claws, or an aggressive nature.

Because I was interested in perceptions of risk from deer, even if potential for injury was not mentioned initially, I prompted comments about possible risk by asking visitors if they could think of any ways in which people could be harmed by trying to feed deer. Even with prompting, only 59% of the interviewed groups felt that deer could injure people if they got too close, and the biggest concern of injury was from ticks or disease. The potential for getting kicked was mentioned by four groups, and two groups thought the deer might bite them. A few visitors also recognized that bucks could be dangerous, especially during rutting season. The following quotes illustrate the responses given:

"The deer have a tendency to paw people sometimes, to jump up on them. It can be very dangerous."

"And also, I'll tell you what, a deer could hurt you. It has hard feet. They can be very dangerous."

“Not unless it was a buck or something...a buck can get right rowdy...”

“Maybe the virus, not the deer, the virus might be, but not deer.”

“Uh, if you really scared the deer, they could try to hurt you. They can nip and kick.”

“I don’t know that deer could be dangerous. I guess, I don’t know if they, they nip you or something.”

Some of the above responses illustrate that even the visitors who agreed deer might hurt them did not believe it very strongly. Others simply did not believe that a deer could hurt them:

“I don’t think they’d be dangerous. A bear maybe, but not a deer.”

“They don’t get excited if the little fawn gets around close to you like a bear does, so I don’t see no potential for harm at all.”

“No, none whatsoever.”

Visitors also appeared to be drawing upon direct and indirect experiences while assessing the potential for personal risk. Because they had never seen or heard of anyone getting hurt by a deer, they concluded that there was little or no risk. Other visitors seemed to feel that they controlled the outcome of interactions, indicating that deer were not a threat unless you did something stupid around them (like trying to pet them).

“Children could get hurt I guess if they got too close, maybe. I’ve never heard of a deer attacking anybody, no.”

“Uh, if they do something they shouldn’t do and go up and - I mean I wouldn’t go and try to pet a deer. You know, I mean, other than that I don’t know any circumstances when they have become aggressive.”

“No, really I don’t, I’ve never seen anything harmful...I’ve never seen a deer actually trying to hurt people...if you just use your head a little bit.”

Survey responses confirm what the interviews suggested; visitors do not believe that deer could injure them. When asked about the specific statements in the fear appeal

(disease, kicking, biting, goring), the control group either disagreed that deer could hurt them or slightly agreed (0.1- 0.2) (Table 11). Survey respondents clearly were not scared of deer, and, as the interviews suggested, visitors do not think that deer are very dangerous unless you try to touch them (Table 12).

Results from the surveys indicate that the fear appeal message was effective in changing attitudes about the risk of getting too close to deer, at least for the items specifically targeted by the intervention. The other items suggested limited cognitive change of a broader nature. However, even though there was a significant increase in the belief that deer could be dangerous, respondents still did not agree very strongly with the fear appeal statements. Mean level of agreement ranged from 0.2 to 1.0. These agreement levels were much lower than the levels of agreement with statements from the moral appeal (0.9 - 1.5) (Table 13).

Effectiveness of interventions in changing behavior

Moral appeal

The moral appeal reduced the percentage of groups feeding deer from 63% in the control condition to 25%. The plea for helping the deer by not feeding them was more effective than the fear appeal in reducing feeding behavior. This may seem like a surprising finding because the moral appeal did not significantly change attitudes about the negative aspects of feeding deer, whereas the fear appeal did cause an increase in awareness about the risk of feeding deer. Based upon these results from the attitude survey, one would have expected the fear appeal to produce the greatest reduction in feeding behavior.

One possible explanation for the behavioral success of the moral appeal is that it simply made already held attitudes salient or more accessible, which increased the likelihood that these attitudes would influence behavior. The attitude survey findings suggested that, even in control conditions, visitors agreed rather strongly with the message arguments about the negative impacts feeding has on deer, but just because

those attitudes were available in visitors' memories does not mean they were accessible at the time that the deer approached their picnic table and they had to make a decision about feeding the deer (Lynch and Srull 1982). Under the moral treatment condition, the intervention, which was presented shortly before the opportunity to feed deer, may have served to prime or make salient their previously held attitudes about feeding deer (Roskos-Ewoldsen 1997).

Psychologists have found that many factors can influence the accessibility of attitudes. Lynch and Srull (1982) believe that the amount of competing information that has been learned in the same "content domain" can influence accessibility of attitudes. In the case of deer and other common, high-profile animals, many people have a considerable amount of prior knowledge (from direct and indirect experiences) and beliefs and attitudes about deer. For example, hunting is an issue about which most people have given considerable thought and have relatively strong feelings (either positive or negative). The media also provide information about deer from a variety of perspectives such as hunting programs, nature shows, and movies like "Bambi." While all of this information and attitudes about deer are presumably available in someone's memory, they are not all accessible all of the time and will not all necessarily be activated upon seeing a deer.

In the case of seeing deer in the picnic area, the thrill of seeing a deer up close may trigger more emotional types of attitudes than more cognitive or informational beliefs and attitudes about impacts of humans on deer. Arousal has been shown to decrease the range of cues in the environment which are attended to and may therefore limit the amount of information processed about feeding deer (Taylor and Fiske 1978). Clearly visitors get excited about seeing deer up close in SNP, and Americans tend to feel emotional attachment to individual animals instead of thinking in broad ecological terms (Kellert 1993). The thrill of seeing a deer up close and wanting to bond with it may inhibit the retrieval of available attitudes that getting too close to or trying to feed the deer may actually hurt it. The moral appeal may alter these circumstances.

Another factor that influences the retrieval of attitudes from memory is the way in which the attitude was formed. Attitudes that were formed from direct experience with the attitude object will be much stronger and more easily accessed than attitudes formed by indirect experience (Fazio and Zanna 1981). According to Fazio and Zanna (1981), attitudes formed by direct experience are stronger because they are based upon actual behavior and the behavior itself is salient. Direct experience also provides more information, and a person is more certain or confident of the accuracy of the information. Attitudes formed by direct experience also tend to be more persistent over time. All of these factors of directly experienced interactions with an attitude object (increased strength, salience, amount of information, and persistence) tend to make the attitude more accessible, which in turn allows it to influence behavior.

The concept of directly versus indirectly obtained attitudes and their different levels of salience is critical for understanding what attitudes are accessible to a visitor when confronted with the opportunity to feed a deer. The majority of the visitors surveyed and interviewed had been to SNP previously and had undoubtedly interacted with deer before in SNP and elsewhere. The excitement of seeing deer up close, and possibly following them around to get a close-up picture of a buck with a big rack or a doe with fawns would form stronger and more accessible attitudes about appropriate behaviors around deer than attitudes gained from watching a nature show or reading an interpretive sign about reasons not to feed deer, which were formed from indirect experience with the attitude object. Perhaps seeing the moral appeal prior to the opportunity to feed deer primed the normally inaccessible attitudes about the negative aspects of feeding deer and made them more accessible.

While the level of past experience in SNP was not shown to be significantly related to differences in attitudes, this does not mean that prior experience with deer in SNP did not influence behavior. The measure of experience used (number of past visits) was general and the experiences which would be much more salient would be ones directly related to interactions with deer, at SNP or elsewhere.

A related concept to experience, which also influences attitude accessibility, is the strength of the relationship between the attitude and the attitude object. Attitudes that are more strongly linked to an attitude object are more easily, chronically, and spontaneously accessed (Fazio and Williams 1986) and they are much more likely to influence behavior (Fazio *et al.* 1986; Fazio and Williams 1986; Roskos-Ewoldsen 1997). In addition, these strong, easily accessible attitudes are more difficult to change by persuasion, because once the attitude is activated it can filter and alter perceptions of the situation (Fazio *et al.* 1986; Fazio and Williams 1986).

Aside from internal factors affecting attitude accessibility, external cues can also influence whether or not a given attitude becomes accessible in a given situation (Lynch and Srull 1982). In this study, one of the relevant external cues may have been the behavior of the deer. Deer in the picnic area obviously begged for food. They were often observed going from table to table begging for food by acting submissive and bobbing their heads. This may have provided direct observational cues to the visitor that the deer wanted to be fed, and that other people had probably fed the deer before or they would not be acting that way. This would tend to send the message that feeding was acceptable because the deer appeared healthy and were coming back for more handouts. Even more compelling cues can come from the behavior of other people toward the deer. The picnic area almost always had several groups in it, usually within sight of each other, when the deer came begging for food. The behavior of those other visitors (whether they fed them, ignored them, or chased them away) undoubtedly influenced retrieval of attitudes about deer and feeding deer.

Another factor influencing attitude accessibility is the goal of the individual in a given situation. The information retrieved from memory is likely to be most related to the goals one desires to meet (Lynch and Srull 1982). For example, picnickers may be in SNP to have a good time and to interact with nature. While they probably do not want to hurt nature (the deer), their immediate goal for the day is to have fun and do something exciting. These goals would tend to favor accessing positive emotions and

attitudes associated with getting close to and interacting with deer, rather than accessing altruistic attitudes about helping deer by staying a greater distance away from deer.

Salient or easily accessible attitudes are more likely to predict behavior of visitors for two important reasons. First, salient attitudes tend to alter or filter out attention to different aspects (Roskos-Ewoldsen 1997) and perceptions of the object and situation (Fazio *et al.* 1983). Salient attitudes therefore can lead to selective processing of information, which tends to favor information consistent with the already held attitude (Fazio *et al.* 1986; Fazio and Williams 1986). This is important because behavior in a given situation is determined by the perceptions of the attitude object and the situation in which it is encountered (Fazio and Williams 1986). In the case of deciding whether or not to feed deer, attitudes about the positive emotional aspects of interacting with a beautiful animal in nature would be competing with attitudes about protecting the deer by not feeding it. In addition to coloring perceptions about competing attitudes, marketing research has shown that salient attitudes about one brand can even inhibit recall of information about the competing brand (Alba and Chattopadhyay 1986). This suggests that the set of attitudes that is most salient in a given situation could outweigh and even prohibit the recall of competing attitudes. The moral appeal, then, may be effective because it raises non-feeding attitudes into awareness. Without the moral appeal reminder those non-feeding attitudes might be suppressed by more salient attitudes based on the excitement of seeing deer and wanting to get close to them.

In the context of persuasion, salience has also been shown to influence the degree of message elaboration. Having accessible attitudes toward the topic of the message increases the chance of central-route processing (Roskos-Ewoldsen 1997). Therefore the intervention must make information stored in the memory about the negative impacts of feeding deer accessible so that it can be processed thoughtfully. The goal of this study was to encourage central route processing so that the attitudes about not feeding deer would be strong and persistent over time.

Evidence of central route processing with the moral appeal

The attitude survey on the message arguments related to the moral appeal provided little to no evidence that the moral appeal message had been processed by the central route. In fact, there was not even any attitude change detected in the items taken directly from the moral appeal (Table 13) or in items related to the moral appeal (Table 14). However, it appears that there was no attitude change in items related to the moral appeal because the attitudes were already present in the population. Therefore, central route processing cannot be ruled out based upon the survey results.

Some evidence of message elaboration was present, however, in attitudes toward concepts relating to the benefits of watching deer (Table 24). Visitors in the moral appeal treatment seem to have received less benefit from watching deer in SNP than the control group visitors. For example, the moral appeal group agreed significantly less than the control group with the statements that the park feels more natural when deer are around and that the park feels more like a wilderness when deer are seen in the campground. Moral appeal visitors also were more bothered by seeing deer that were unafraid of people. These responses suggest that moral appeal visitors elaborated beyond the message and began to feel that seeing the deer up close was not as natural and not as much of an exciting experience.

The behavioral results in the campground also seem to show some evidence of message elaboration. Although the moral appeal only addressed issues about the negative impacts of feeding, moral appeal visitors were less likely than visitors in either the fear appeal or control group to approach or follow deer (Table 21). The lack of approaching and following could be because it was not as exciting to see deer once it was realized that they were close to people in order to get a handout, or it could be that they felt that not approaching deer would help keep them more wild. From the results of this study it is not possible to tell what the reasoning was, but something in the moral message definitely triggered some other thought processes, which influenced behavior.

Fear appeal

Although not as effective as the moral appeal in changing behavior, the fear appeal did reduce feeding behavior in the picnic area below levels seen in the control group. Although the message did change attitudes about visitors' safety around deer, nearly 40% of the groups continued to feed deer in the picnic area under the fear appeal. There are several possible explanations why the fear appeal was not as effective as the moral appeal. One was that, as discussed previously, the visitors simply did not believe the message. Evidence for this is found in similar levels of disagreement to the statement "I'm afraid of deer." Another key reason was that the fear appeal did not convey any level of risk or probability of getting injured if you got too close to deer. Another possibility is that the message had a boomerang effect for some risk-loving visitors by making approaching deer seem more exciting because of the risk involved. Each of these possibilities is discussed below.

The first reason, that some visitors did not believe the message, was discussed previously in the context of the intervention's effectiveness at changing attitudes. Visitors see deer as gentle, passive herbivores without teeth and fangs, and therefore simply do not believe that they can be dangerous. Because the information on the sign is so counter-attitudinal, the message probably should have included more graphic details, such as a video showing a deer approaching a person and knocking them down or kicking them, in order to begin to change attitudes. Severity of injury has been shown to predict compliance with fear appeals (Smith 1997); therefore more detailed descriptions of serious injury (e.g., concussions, death, or specific diseases) may have enhanced the effectiveness of the appeal. The appeal did include information people assimilated (and thus the significant change in beliefs), but did not create immediate concern (therefore, less behavioral effect).

Probably the biggest weakness of the fear appeal was that it did not provide information on the level of risk associated with getting too close to deer. Higher probabilities of risk or susceptibility have been shown to increase the chances that a person intends to act or will act in a way to avoid the consequences (Maddux and Rogers

1983; Rogers 1985; Smith 1997; Witte 1993). In another study on the effectiveness of different messages on reducing wildlife feeding, a fear appeal was more effective than a moral appeal in decreasing squirrel feeding, most likely because there was a recent local death from bubonic plague, which undoubtedly made the level of risk seem higher (Schwarzkopf 1984, *cited in* Gramann and Vander Stoep 1987). The level of risk was intentionally excluded from this fear appeal because the actual risk of being injured is very low, and it most likely would not promote safety-conscious behavior. Thus, the lower effect on behavior seems quite rational.

Another possibility that may explain why the fear appeal had less impact was that it somehow made it more exciting to get close to deer if there was a risk involved. There is some evidence of this from the campground observations (Table 21). Campers in the fear appeal group tended to be more likely than moral appeal or control groups to approach and follow deer. They were also more likely to photograph deer and get closer to deer. Despite a specific warning in the fear appeal to not approach a deer, 65% of the individuals in the fear appeal were observed to come within 5 yards of the deer, compared with only 7% from the moral appeal and 30% in the control condition (Table 22). Although feeding deer is not necessarily the next logical step beyond simply approaching deer for everyone, the added thrill some may feel from taking a risk could explain why incidence of deer feeding did not decrease more in the picnic area.

Evidence of central route processing with the fear appeal

While attitudes toward the danger from deer changed significantly in the items taken directly from the fear appeal, the lack of strong agreement with the statements suggests that the change in attitudes may not have been very strong or stable. Although there was some evidence from the fear-related items that suggested message elaboration based upon significant differences in beliefs, there was still low level of agreement with the statements (Table 12). For example, fear appeal visitors only slightly agreed (0.4) with the statement that having deer too close can endanger small children. They also only slightly disagreed (-0.5) with the statement that it was not very likely that a deer would hurt them if they tried to feed it.

The behavioral evidence also suggests that the fear appeal probably was not processed thoughtfully. While it did reduce feeding behavior in the picnic area, it seemed to increase approaching and following behavior in the campground. These conflicting behaviors suggests that the message may have reduced feeding behavior because it was temporarily salient in the picnic area, but that it also aroused excitement about getting close to deer because of the risk over the long term. Another explanation is that people follow, but do not feed because feeding requires a person to be very close and susceptible to higher levels of risk. Following at a distance perceived to be safe, may still be viewed as acceptable.

Planned behavior versus spontaneity

The above discussions about the effectiveness of the interventions to change attitudes and behavior of visitors have mainly assumed that visitors' actions are reasoned and deliberate. Recreation researchers have most often used the Theory of Planned Behavior (Ajzen 1987) to justify the emphasis on interpretive strategies that promote central route processing because it suggests that visitors think carefully and rationally about their behaviors. However, observations of interactions between deer and visitors made during this research suggest that the behaviors associated with deer may not be planned but spontaneous or impulsive in nature.

For the most part (except for a few visitors who came to the picnic area specifically to see deer), the sight of a deer approaching one's picnic table is a sudden, unanticipated event, mostly because it is not normal for deer to walk up to people. Also, the event does not last very long; it may only be a matter of seconds before the deer decides you are not going to feed it and it moves on to the next table. For these reasons the reaction of the visitor to deer and his or her subsequent behavior is more likely to be a quick, rather spontaneous response instead of a response that is well thought-out.

Many decisions that people make are not well thought out and are simply responses to the most salient stimuli in the environment (Talyor and Fiske 1978; Lynch and Srull 1982). This thoughtless processing is related to the relative inaccessibility of

attitudes that could promote thoughtful processing before engaging in a behavior. As discussed previously, people do not always reason through all of the information available; they simply use what is most salient to guide their behavior. Without the activation of anti-feeding attitudes, visitors most likely would act on other salient features of the object in the situation. This could lead to behavior that is incongruent with negative attitudes about feeding deer. The interventions in this study may have reduced feeding behavior only because they were read by the visitor shortly before the opportunity to feed deer was available. This undoubtedly acted to make the concepts in the message more salient and possibly allowed the visitor to form behavioral intentions not to feed the deer, prior to the arrival of the deer. This may have thereby minimized spontaneous feeding of deer.

Why do visitors feed deer and can managers stop them?

This question is difficult for even feeders to answer. There appears to be a strong emotional pull to get closer to wildlife and have a close interaction with them. When asked why they fed the deer, most feeders responded that they just wanted to get closer to them. They clearly were feeding the deer for their own personal benefit, because none of the feeders interviewed thought that feeding helped or benefited the deer in any way (with the exception of one individual who thought deer deserved a treat now and then). I also believe that people wouldn't feed the deer if they truly believed that their individual action would hurt the deer.

The moral appeal targeted a higher level of moral reasoning than the fear appeal. It asked visitors to help the deer by not feeding them, and the behavioral results show that the majority of visitors responded positively to this type of appeal. The fear appeal was targeted at concerns for personal safety, a lower level of moral reasoning. As discussed above, the fear appeal probably did not work as well because a high level of risk for injury was not conveyed in the message.

Another important level of risk for those individuals at a low level of moral reasoning, which was not conveyed, was the risk of getting caught and fined. The vast

majority of visitors reported seeing at least one message about not feeding wildlife while in SNP (14 of 15 groups interviewed and 72% of campers in the control condition); therefore, ignorance of the rules cannot be an explanation for the level of feeding seen in the picnic area. However, the perception of getting caught was that it was highly unlikely. Feeders said that they hardly ever saw rangers and that all they had to do was look around before they fed the deer to avoid being caught. Unfortunately, the perceptions of the visitor are correct in this instance. In 1997 only 20 citations were issued for bothering/molesting wildlife (Blount 1998). Considering that the Park had approximately 1.7 million visitors that year, and 3% fed the deer (a conservative estimate based upon the percentage of campground visitors self-reporting that they had fed deer), that would mean that 51,000 people fed deer. That would mean that each visitor only had a 0.04% chance of being caught at feeding deer and fined.

Generalizability of results

There were some behavioral differences between the campground and picnic area visitors, which introduces the question of whether these two groups are different on some key variables affecting attitudes and behavior. The major behavioral difference was that campground visitors were not nearly as likely to feed the deer. Unfortunately, it is not clear whether this was due to a difference in populations or differences in deer behavior. The deer in the campground did not beg for food as the picnic area deer did. The deer begging may have acted as a releaser-cue (Gramann and Vander Stoep 1987) in the picnic area, which triggered the feeding by the visitors. Regardless, these differences suggest that one should be cautious in generalizing, and that additional research (e.g., survey the picnic area) could rule out causes.

There did appear to be some differences in the two populations on the level of past use of SNP and possibly cultural differences. While the interview information on past use does not fit neatly into the categories used on the survey, responses indicated that at least 50% of the picnic area visitors had been to SNP more than 20 times, a far higher percentage than what was found in the campground. Many picnickers who were interviewed said that they “practically lived up here,” and others mentioned that they came up every weekend. Personal observations also suggest that picnickers were often

in large, extended family groups and a higher proportion were also of non-Caucasian backgrounds than in the campground. These factors could potentially explain some of the differences in behaviors seen.

On a larger scale, we know of no reason to suspect that Shenandoah visitors are systematically different from those who visit parks in other areas of the country. However, it is possible that the clientele (largely from the D.C. area) may differ from other parks.

Management implications

This research has several important management implications for the National Park Service and other natural resource agencies. Deer feeding is a serious issue for the National Park Service because it is mandated to protect the resource as well as provide recreation opportunities for visitors. This research documents a high amount of wildlife feeding in a National Park (63% of picnic groups fed deer), an activity that not only negatively impacts wildlife but also poses a considerable risk to the visitors. While complete elimination of deer feeding was not achieved, the research findings suggest persuasive techniques that may be successful in reducing the level of feeding currently present.

1. Findings from this research suggest that signs should be placed strategically in order to make the message salient to visitors prior to the opportunity to act. Many elements of the results suggest that attitude accessibility or saliency may be key to changing behavior. Signs should therefore be placed where an individual can read the message shortly before experiencing the opportunity and urge to act inappropriately.
2. Increase the belief that wild animals can be hazards. This will be especially difficult when an animal is perceived as being tame and gentle. Video displays of visitors being injured may be necessary to gain attention and shock visitors into believing the risks. Also, provision of feasible statistics such as the number of visitors injured per year may help to convey level of risk. Future research must be done in this area to investigate the best method of using risk to convince visitors to change their behavior, even when the level of risk is relatively low.
3. Under the most effective appeal, 25% of the groups fed deer; this is still probably too

high a rate to discourage deer from begging. Additional research needs to be done to understand why the message did not prevent those visitors from feeding deer in order to design a more effective intervention. Unfortunately, depending on their motives behind feeding deer, it is possible that the only way to reach these visitors may be to raise the fines or to increase patrols so that the perception of getting caught is higher.

Future research

Effect of risk information

It would be extremely useful to understand an effective way to convey risk and gain compliance under low-risk situations. Some information is known about heuristics (and their associated errors) that people use in reasoning through statistical information (Tversky and Kahneman 1974), but there has been little to no research done about how to present statistics to the public to gain compliance (Mehta and Simpson-Housley 1997). For example, it is unclear whether it would be better to give numbers of people injured in a year versus the percentages of visitors injured.

Effect of tone

While the moral appeal was the most effective, it was not entirely clear why. Was it because the novel, funny approach was more appealing than typical Park Service signs, or was it the message content itself that was most effective in gaining compliance? It would also be interesting to test whether or not the stronger message tone (e.g., a fed deer is a dead deer), which has been adopted by some parks, would be more effective than the helping, humorous tone presented in this moral appeal.

Norms and social influence

Another potential research area would be the role that social norms could play in reducing feeding behavior. While 83% of the visitors said that it bothered them to see people feeding deer, there appeared to be little intergroup pressure to not feed the deer or group sanctions when someone did. However, I was often close enough to hear groups discussing whether or not they should have fed the deer; therefore, there may be some

opportunities for the Park Service to promote normative types of monitoring and sanctioning to reduce feeding. Social support for gaining compliance with interventions has been shown to be a critical factor in other research (Geller *et al.* 1990).

Population differences

The results from the behavioral portion of this research suggest that there may be population differences between picnickers and campers. Thus, the question remains whether or not picnickers changed their attitudes as well as behavior. Population differences in experience level, prior knowledge level, and trip motives should also be investigated because these variables clearly influence the type of appeal that would be most successful in gaining compliance.

Conclusions

Clearly, this research uncovered a significant wildlife feeding problem in Shenandoah National Park. On a positive note, the moral appeal resulted in a 60% decrease in feeding behavior in the picnic area. The findings also suggest that visitors are already fairly knowledgeable about the negative consequences that feeding has on the deer and that simply reminding them before they have the opportunity to feed deer may be sufficient to reduce the level of feeding. This has significant implications for the placement of interventions in park settings. The results also highlight the lack of knowledge and beliefs in SNP visitors that deer could hurt them. Findings also suggest that convincing visitors of the risk may prove difficult because of firmly held schema of deer as gentle, peaceful creatures. Because wildlife feeding has negative consequences for both wildlife and visitors, further research is clearly necessary in order to clarify attitudes of park visitors toward wildlife and wildlife feeding and develop intervention techniques that are more successful in reducing feeding behavior.

LITERATURE CITED

- Ajzen, I. 1985. From intentions to actions: a Theory of Planned Behavior. Pp. 11-39. In J. Kuhl and J. Beckmann (eds.), *Action-control: From Cognition to Behavior*. Springer, Heidelberg.
- Ajzen, I. 1987. Attitudes, traits, and actions: dispositional prediction of behavior in personality and social psychology. In L. Berkowitz (ed.), *Advances in Experimental Social Psychology* 20:1-63. Academic, New York.
- Ajzen, I. and B. L. Driver. 1992. Application of the Theory of Planned Behavior to leisure choice. *Journal of Leisure Research* 24:207-224.
- Alba, J. W., and M. Chattopadhyay. 1986. Saliency effects in brand recall. *Journal of Marketing Research* 23:363-369.
- Blount, T. 1998. Wildlife feeding - - who wins? Resource Management Newsletter. Shenandoah National Park. January 1998.
- Braithwaite, A. M. and S. F. McCool. 1989. Social influences and backcountry visitor behavior in occupied grizzly bear habitat. *Society and Natural Resources* 2:273-283.
- Bryan, R. B. and M. C. Jansson. 1973. Perceptions of wildlife hazards in National Park use. In Hende, J. and Schoenfeld (eds.), *Human Dimensions in Wildlife Programs*. U.S.G.P.O., Washington, D. C.
- Cacioppo, J. T., and R. E. Petty. 1979. Effects of message repetition and position on cognitive responses, recall, and persuasion. *Journal of Personality and Social Psychology* 37:97-109.
- Cacioppo, J. T., R. E. Petty, C. F. Kao, and R. Rodriguez. 1986. Central and peripheral routes to persuasion: an individual difference perspective. *Journal of Personality and Social Psychology*. 51(5):1032-1043.
- Cella, W. B., and J. Keay. 1979. Annual bear management and incident report, Yosemite National Park. U.S. Department of the Interior, National Park Service, El Portal, CA. Cited in Braithwaite, A. M. and S. F. McCool. 1989.
- Chaiken, S. 1980. Heuristic versus systematic information processing and the use of source versus message cues in persuasion. *Journal of Personality and Social Psychology* 39(5):752-766.
- Chesher, G. K. 1995. A fed deer is a dead deer: talking to the public about wildlife reductions. *Nature Notes, Grand Canyon National Park* 11(1):5-6.

- Cialdini, R. B., R. R. Reno, and C. A. Kallgren. 1990. A focus theory of normative conduct: recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology* 58(6):1015-1026.
- Cole, D. N. 1998. Written appeals for attention to low-impact messages on wilderness trailside bulletin boards: experimental evaluations of effectiveness. *Journal of Parks and Recreation Administration* 16(1):65-79.
- Drake, K. L., V. C. Conzola, and M. S. Wogalter. 1998. Discrimination among sign and label warning signal words. *Human Factors and Ergonomics in Manufacturing* 8:289-301.
- Dwyer, W. O., M. G. Huffman, and L. H. Jarratt. 1989. A comparison of strategies for gaining compliance with campground regulations. *Journal of Parks and Recreation Administration* 7(4):21-30.
- Fazio, R. H., M. C. Powell, and P. M. Herr. 1983. Toward a process model of the attitude-behavior relation: accessing one's attitude upon mere observation of the attitude object. *Journal of Personality and Social Psychology* 44(4):723-735.
- Fazio, R. H., D. M. Sanbonmatsu, M. C. Powell, and F. R. Kardes. 1986. On the automatic activation of attitudes. *Journal of Personality and Social Psychology* 50(2):229-238.
- Fazio, R. H. and C. J. Williams. 1986. Attitude accessibility as a moderator of the attitude-perception and attitude-behavior relations: an investigation of the 1984 presidential election. *Journal of Personality and Social Psychology* 51(3):505-514.
- Fazio, R. H. and M. P. Zanna. 1981. Direct experience and attitude-behavior consistency. *Advances in Experimental Social Psychology* 14:161-202.
- Geller, E. S., T. D. Berry, T. D. Ludwig, R. E. Evans, M. R. Gilmore, and S. W. Clarke. 1990. A conceptual framework for developing and evaluating behavior change interventions for injury control. *Health and Education Research* 5(2):125-137.
- Gramann, J. H., R. L. Bonifield, and Y. Kim. 1995. Effect of personality and situational factors on intentions to obey rules in outdoor recreation areas. *Journal of Leisure Research* 27(4):326-343.
- Gramann, J. H. and G. A. Vander Stoep. 1987. Prosocial behavior theory and natural resource protection: a conceptual synthesis. *Journal of Environmental Management* 24:247-257.

- Hendricks, W. W., R. H. Ramthun, and D. J. Chavez. 1999. The effects of message source and appeal type on social trail etiquette behavior of mountain bicyclists. Abstract from 1999 Leisure Research Symposium, National Recreation and Park Association Congress.
- Hockett, K. and T. Hall. 1999. Shenandoah National Park Backcountry and Wilderness Visitor Survey. *Prepared for* National Park Service, U. S. Department of the Interior, Shenandoah National Park. Virginia Tech, Department of Forestry.
- Johnson, D. R. and T. C. Swearingen. 1992. The effectiveness of selected trailside sign texts in deterring off-trail hiking at Paradise Meadow, Mount Ranier National Park. Pp. 103-119 *In* Christensen, H. H., D. R. Johnson, and M. H. Brookes (eds.), *Vandalism: Research, Prevention, and Social Policy*. U. S. Department of Agriculture, Forest Service, General Technical Report PNW-GTR-293.
- Jones, M. L., N. E. Mathews, and W. F. Porter. 1997. Influence of social organization on dispersal and survival of translocated white-tailed deer. *Wildlife Society Bulletin* 25(2):272-278.
- Jope, K. L., and B. Shelby. 1984. Hiker behavior and the outcome of interactions with grizzly bears. *Leisure Sciences* 6:257-270.
- Kellert, S. R. 1993. Attitudes, knowledge, and behavior toward wildlife among the industrial superpowers: United States, Japan, and Germany. *Journal of Social Issues* 49:53-69.
- Knight, R. L. and D. N. Cole. 1991. Effects of recreational activity on wildlife in wildlands. Pp. 238-247. Trans. 5th North American Wildlife and Natural Resources Conference.
- Knight, R. L. and S. A. Temple. 1995. Origin of wildlife responses to recreationists. Pp. 81-91. *In* R. L. Knight and K. J. Gutzwiller (eds.), *Wildlife and Recreationists: Coexistence Through Management and Research*. Island Press, Washington D.C.
- Kohlberg, L., C. Levine, and A. Hewer. 1983. Moral stages: a current formulation and a response to critics. *In* J. A. Meacham (ed.), *Contributions to Human Development*, Vol. 10. Karger, New York.
- Kraus, S. J. 1995. Attitudes and the prediction of behavior: a meta-analysis of the empirical literature. *Personality and Social Psychology Bulletin* 21:58-75.
- Krauss, R. M, J. L. Freedman, and M Witcup. 1978. Field and laboratory studies of littering. *Journal of Experimental and Social Psychology* 14:109-122.

- Krumpe, E. E., and P. J. Brown. 1982. Redistributing backcountry use through information related to recreation experiences. *Journal of Forestry* 80:360-362, 364.
- Leippe, M. R., and R. A. Elkin. 1987. When motives clash: issue involvement and response involvement as determinants of persuasion. *Journal of Personality and Social Psychology* 52(2):269-278.
- Leslie, E. 1995. Human/wildlife interactions: the effects and consequences. *Nature Notes, Grand Canyon National Park* 11(1):1-3.
- Lucas, R. C. 1990. Wilderness recreation management: a general overview. Pp. 401-422. In J. C. Hendee, G. H. Stankey, and R. C. Lucas (eds.), *Wilderness Management*. North American Press, Golden, Colorado.
- Lynch, J. G., Jr., and T. K. Srull. 1982. Memory and attentional factors in consumer choice: concepts and research methods. *Journal of Consumer Research* 9:18-37.
- Madden, T. J., and M. G. Weinberger. 1982. The effects of humor on attention in magazine advertising. *Journal of Advertising* 11(3):8-14.
- Maddux, J. E. and R. W. Rogers. 1983. Protection motivation and self-efficacy: a revised theory of fear appeals and attitude change. *Journal of Experimental and Social Psychology* 19:469-479.
- Manfredo, M. J. and A. D. Bright. 1991. A model for assessing the effects of communication on recreationists. *Journal of Leisure Research* 23(1):1-20.
- Martin, D. C. 1992. The effect of three signs and a brochure on visitors' removal of pumice at Mount St. Helens. Pp. 121-131 In Christensen, H. H., D. R. Johnson, and M. H. Brookes (eds.), *Vandalism: Research, Prevention, and Social Policy*. U. S. Department of Agriculture, Forest Service, General Technical Report PNW-GTR-293.
- McAvoy, L. H., and D. L. Dustin. 1983. Indirect versus direct regulation of recreation behavior. *Journal of Park and Recreation Administration* 1(4):12-17.
- McCool, S. F., and A. M. Braithwaite. 1992. Persuasive messages and safety hazards in dispersed and natural recreation settings. Pp. 293-326. In M. Manfredo (ed.), *Influencing Human Behavior: Theory and Applications in Recreation, Tourism, and Natural Resources Management*. Sagamore Publishing Inc., Champaign, IL.
- McCool, S. F., and A. M. Braithwaite. 1989. Beliefs and behaviors of backcountry campers in Montana toward grizzly bears. *Wildlife Society Bulletin* 17(4):514-519.

- Mehta, M. D. and P. Simpson-Housley. 1997. Effect of numerical representations of risk on perception. *Perceptual and Motor Skills* 84:714.
- Olson, E. C., M. L., Bowman, and R. E. Roth. 1984. Interpretation and nonformal environmental education in natural resources management. *Journal of Environmental Education* 15(4):6-10.
- Petterson, J. 1995. Before it's too late: beggar sheep prevention through aversive conditioning. *Nature Notes, Grand Canyon National Park* 11(1):4.
- Petty, R. E. 1995. Attitude change. Pp. 195-255. In A. Tesser (ed.), *Advanced Social Psychology*. McGraw-Hill, New York.
- Petty, R. E. and J. T. Cacioppo. 1984. The effects of involvement on responses to argument quantity and quality: central and peripheral routes to persuasion. *Journal of Personality and Social Psychology* 46(1):69-81.
- Petty, R. E. and J. T. Cacioppo. 1986. The elaboration likelihood model of persuasion. *Advances in Experimental Social Psychology* 19:123-205.
- Petty, R. E., S. McMichael, and L. Brannon. 1992. The elaboration likelihood model of persuasion: applications in recreation and tourism. Pp.77-101. In M. Manfredo (ed.), *Influencing Human Behavior: Theory and Applications in Recreation, Tourism, and Natural Resources Management*. Sagamore Publishing Inc., Champaign, IL.
- Pollick, S. 1999. Feeding metroparks wildlife may result in citations, fines. *Toledo Blade*. 9/12/99, Section C, pg. 11.
- Reiter, S. M. and W. Samuel. 1990. Littering as a function of prior litter and the presence or absence of prohibitive signs. *Journal of Applied Psychology* 10(1):45-55.
- Rogers, R. W. 1985. Attitude change and information integration in fear appeals. *Psychological Reports* 56:179-182.
- Roggenbuck, J. W. 1992. Use of persuasion to reduce resource impacts and visitor conflicts. Pp. 149-208. In M. Manfredo (ed.), *Influencing Human Behavior: Theory and Applications in Recreation, Tourism, and Natural Resources Management*. Sagamore Publishing Inc., Champaign, IL.
- Roggenbuck, J. W. and B. L. Berrier. 1982. A comparison of the effectiveness of two communication strategies in dispersing wilderness campers. *Journal of Leisure Research* 14:77-89.

- Roggenbuck, J. W., C. J. Widner, and D. W. Stratton. 1997. Reducing Theft of Petrified Wood at Petrified Forest National Park: A Final Research Report. *Submitted to:* National Park Service, U. S. Department of the Interior, Petrified Forest National Park. Virginia Tech, Department of Forestry.
- Roskos-Ewoldsen, D. R. 1997. Attitude accessibility and persuasion: review and a transactive model. Pp. 185-225 *In* B.R. Burleson (ed.), *Communication Yearbook 20*. Sage Publications, Thousand Oaks.
- Samdahl, D. M. and H. H. Christensen. 1985. Environmental cues and vandalism: an exploratory study of picnic table carving. *Environment and Behavior* 17(4):445-458.
- Schwartz, S. H. 1970. Moral decision making and behavior. Pp. 127-144 *In* J. Macaulay and L. Berkowitz (eds.), *Altruism and Helping Behavior: Some Psychological Studies of Antecedents and Consequences*, Academic Press, New York.
- Schwarzkopf, S. K. 1984. Feeding of golden-mantled ground squirrels by park visitors at Crater Lake National Park. Res. Pap. CPSU/OSU 84-9, Corvallis, Oregon: National Park Service Cooperative Park Studies Unit. *Cited in* Gramann and Vander Stoep. 1987.
- Smith, S. L. 1997. The effective use of fear appeals in persuasive immunization: an analysis of national immunization intervention messages. *Journal of Applied Communication Research* 25:264-292.
- Solomon, M. R. 1992. *Consumer Behavior: Buying, Having, and Being*. Allyn and Bacon, Boston.
- Taylor, S. E. and S. T. Fiske. 1978. Salience, attention, and attribution: top of the head phenomena. *Advances in experimental and social psychology* 11:249-287.
- Tomback, D. F. and C. L. Taylor. 1986. Tourist impact on Clark's nutcracker foraging activities in Rocky Mountain National Park. Pp. 152-172. *In* F. J. Singer (ed.), *Proceedings of the Fourth Triennial Conference on Research in the National Parks and Equivalent Reserves*. Colorado State University, Fort Collins, Colorado *Cited in* R. L. Knight and S. A. Temple 1995.
- Tversky, A., and D. Kahneman. 1974. Judgment under uncertainty: heuristics and biases. *Science* 185:1124-1131.
- Vander Stoep, G. A. and J. H. Gramann. 1987. The effect of verbal appeals and incentives on depreciative behavior among youthful park visitors. *Journal of Leisure Research* 19(2):69-83.

- Van Liere, K. D., and R. E. Dunlap. 1978. Moral norms and environmental behavior: an application of Schwartz's norm-activation model to yard burning. *Journal of Applied Social Psychology* 8:174-188.
- Weinstein, N. D. 1984. Why it won't happen to me: perceptions of risk factors and susceptibility. *Health Psychology* 3:431-457.
- Witte, K. 1992. Putting the fear back into fear appeals: the extended parallel process model. *Communication Monographs* 59:329-349.
- Witte, K. 1993. Message and conceptual confounds in fear appeals: the role of threat, fear, and efficacy. *Southern Communication Journal* 58:147-154.
- Wogalter, M. S., J. W. Brelsford, D. R. Desaulniers, and K. R. Laughery. 1991. Consumer product warnings: the role of hazard perception. *Journal of Safety Research* 22:71-82.
- Wood, W. 1982. Retrieval of attitude-relevant information from memory: effects on susceptibility to persuasion and on intrinsic motivation. *Journal of Personality and Social Psychology* 42(5):798-810.
- Wood, W., C. A. Kallgren, and R. M. Preisler. 1985. Access to attitude relevant information in memory as a determinant of persuasion: the role of message attributes. *Journal of Experimental Social Psychology* 21:73-85.
- Wu, C. and D. R. Shaffer. 1987. Susceptibility to persuasive appeals as a function of source credibility and prior experience with the attitude object. *Journal of Personality and Social Psychology* 52(4):677-688.

APPENDIX A

1998 Pre-test interview

Hi, my name is Karen Hockett. I am a graduate student from Virginia Tech doing research on the deer in SNP. Could I take a few moments to ask you some questions about your visit to Shenandoah today?

I'd like to record our conversation. It makes things go quicker and I won't hold you up so long. Is that OK?

1. Is this your first trip to SNP?
If no – not including this visit, about how many times have you been to SNP?
2. How long have you been in the park so far on this visit?
3. About how many deer have you seen so far on this visit to SNP?
4. What do you like the most about the deer in SNP?
5. Is there anything you dislike about the deer in SNP?
6. Which of the following best describes your feelings of the way deer should be managed in a national park?
 1. Park managers should take care of the deer and encourage them to come to where the people are.
 2. Park managers should try to keep all the deer healthy even if there are no visitors.
 3. Park managers should let natural forces shape the deer populations, even if some starve.
7. Below are a series of statements that describe park visitors' attitudes toward wildlife like deer. Tell us whether you strongly agree, agree, are neutral, disagree, or strongly disagree with each of the statements.
 1. I generally fear deer in the park and keep my distance.
 2. I care a lot about the suffering of individual deer in the park.
 3. I am not very interested in deer.
 4. I feel a lot of love for deer in the park, they seem almost like pets to me.
 5. I care more about the health of the deer herd than about individual deer.
 6. When deer numbers get so high that they begin to destroy the environment, some deer should be removed.
 7. I think it is OK for people to hunt deer outside the park.

8. Do you think that it is OK for visitors to feed the deer here in SNP?
Why do you think feeding is OK? Can you think of any reasons why you should not feed deer?
Why do you think that feeding is not OK? Probe for personal harm, deer harm, not wild.

If did not see feed - Have you ever fed the deer here in the Park? (If hesitate, reassure that they are not in any trouble.

If no – GOTO 9, if yes – continue

Can you tell me your reasons for feeding deer?
Probe for benefits of feeding for deer and visitor

9. Have you seen any park rules on feeding wildlife?

If yes – where did you see the information and do you remember what it said?

10. Are you aware of any fines in SNP for feeding wildlife?

IF yes - What is the fine? Do you think that the fine should be changed?

11. If you were to feed deer, how likely do you think it is that a ranger would see you?
If a ranger sees you feeding deer, how do you think he or she would react?

1999 Interviews

Hi, my name is Karen Hockett. I am a graduate student from Virginia Tech doing research on the deer in SNP. Could I take a few moments to ask you some questions about your visit to Shenandoah today?

1. Is this your first trip to SNP?
2. How long have you been in the park so far on this visit?
3. About how many deer have you seen so far on this visit to SNP?
4. What do you like the most about the deer in SNP?
5. Is there anything you dislike about the deer in SNP?
6. We are interested in reasons why the park service should encourage or discourage visitors to feed deer in SNP

Why do you think feeding should be discouraged?

Probe: Do you remember where and when you learned the things you mentioned?

Can you think any ways in which feeding may harm the deer?

Can you think of any ways in which feeding deer might be dangerous for people?

Why do you think feeding deer should be encouraged?

(If saw feed) Can you tell me your reasons for feeding the deer?

What are some benefits to the deer from being fed?

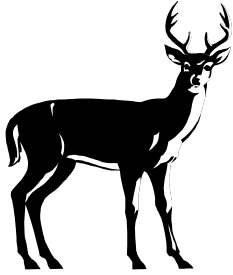
7. Have you seen any park rules on feeding wildlife?

Are you aware of any fines in SNP for feeding wildlife? (If yes) Do you think the fines should be changed?

Have you seen any signs or heard rangers talk about the negative aspects of feeding deer in SNP?

8. If you were to feed deer, how likely do you think it is that a ranger would see you? How do you think he or she would react?

APPENDIX B



*Shenandoah Visitor
Survey*



The National Park Service is interested in understanding how visitors feel about the deer in Shenandoah. This survey is voluntary. However, your participation will ensure that all opinions about deer are represented when the Park Service makes decisions. Your responses will be confidential and your identity will remain anonymous.

1. How many times have you been to Shenandoah National Park before this visit? _____
2. What best characterizes the role wildlife viewing plays in your trip(s) to Shenandoah National Park? (check only one)
 - It is my primary reason for coming to the park. I plan hikes and drives to maximize my chances of seeing wildlife.
 - It is an important part of my visit. I stop and watch wildlife when I see it.
 - It is not a very important part of my visit, but I enjoy seeing wildlife.
 - Wildlife viewing is not a part at all of my visit to SNP.
 - I dislike wildlife and try to avoid it.
3. About how many deer have you seen so far on this visit? _____
4. The following are statements about deer in Shenandoah National Park. Please indicate how much you personally agree or disagree with each item.

	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
As long as you don't try to touch them, deer aren't very dangerous.	+2	+1	0	-1	-2
Watching deer up close helps me learn about nature.	+2	+1	0	-1	-2
The park feels more natural when deer are around.	+2	+1	0	-1	-2
Deer can give people diseases if they get too close.	+2	+1	0	-1	-2
Deer could bite if people get too close.	+2	+1	0	-1	-2
Having deer too close can endanger small children.	+2	+1	0	-1	-2
I don't like deer hanging around my campsite.	+2	+1	0	-1	-2
I get a thrill when I see deer up close.	+2	+1	0	-1	-2
I am scared of deer.	+2	+1	0	-1	-2
Getting close to deer helps me to feel closer to nature.	+2	+1	0	-1	-2
If people get too close to them, deer sometimes kick people.	+2	+1	0	-1	-2
Deer sometimes gore people with their antlers if they get too close.	+2	+1	0	-1	-2
It bothers me to see deer that are unafraid of people.	+2	+1	0	-1	-2
Shenandoah feels more like a wilderness when I see deer in the campground.	+2	+1	0	-1	-2
It is not a problem if park deer are dependent on humans.	+2	+1	0	-1	-2
Deer are more beautiful when you see them up close.	+2	+1	0	-1	-2
It bothers me when deer in the parks starve.	+2	+1	0	-1	-2
Overpopulation of deer is a problem in Shenandoah National Park.	+2	+1	0	-1	-2
I'd rather see wild deer at Shenandoah than deer kept in zoos.	+2	+1	0	-1	-2

5. The following are statements about people feeding deer in Shenandoah National Park. Please indicate how much you personally agree or disagree with each item.

	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
It bothers me to see people feeding deer.	+2	+1	0	-1	-2
People should not feed deer because they will lose the ability to find natural foods.	+2	+1	0	-1	-2
Fed deer are more likely to eat garbage (i.e., rotten food or candy wrappers) that may harm them.	+2	+1	0	-1	-2
It is not very likely that a deer would hurt me if I tried to feed it.	+2	+1	0	-1	-2
It is OK to feed deer natural foods like wild apples, grass, or acorns.	+2	+1	0	-1	-2
Human food could make deer sick.	+2	+1	0	-1	-2
One person feeding deer doesn't really make a difference.	+2	+1	0	-1	-2
Feeding deer is bad because it interferes with natural selection.	+2	+1	0	-1	-2
Deer that are fed are more likely to get hit by cars.	+2	+1	0	-1	-2
Deer that are fed are more likely to get shot by hunters.	+2	+1	0	-1	-2
A deer that approaches people for food is unlikely to behave aggressively toward people.	+2	+1	0	-1	-2
Feeding deer is good because it keeps them from starving.	+2	+1	0	-1	-2
Feeding deer helps them avoid predators (like wolves or bears).	+2	+1	0	-1	-2
Nature is balanced, and humans feeding deer upsets that balance.	+2	+1	0	-1	-2
I'd rather see wild deer than fed deer.	+2	+1	0	-1	-2

6. The following are a list of possible policies Shenandoah managers could adopt. Please indicate whether you support or oppose each policy.

	Strongly Support	Support	Neutral	Oppose	Strongly Oppose
Park managers should feed deer if they are starving in the winter.	+2	+1	0	-1	-2
Park managers should let natural forces shape the deer population (never feed them).	+2	+1	0	-1	-2
Park managers should prohibit visitors from feeding deer.	+2	+1	0	-1	-2
Park managers should provide healthy food for visitors to feed deer.	+2	+1	0	-1	-2
Park managers should create opportunities for people to see deer.	+2	+1	0	-1	-2
Park managers should teach visitors what are healthy foods to feed the deer.	+2	+1	0	-1	-2
Park managers should fine visitors for feeding deer.	+2	+1	0	-1	-2
Park managers should take care of sick or injured deer.	+2	+1	0	-1	-2
Park managers should relocate deer from overpopulated areas.	+2	+1	0	-1	-2

7. On this visit to Shenandoah did you (mark all that apply)

- stop and watch deer
- feed or attempt to feed deer
- photograph deer
- see others feeding deer
- approach deer to get closer
- none of the above
- follow deer if they started to move away from you

8. While in Shendandoah, did you see any messages about feeding or approaching deer?

- No
- Yes → Where? _____

9. What is your age? _____ 10. Are you male or female ?

11. What is your highest level of education?

- Some high school
- Some college
- Master's degree
- High school diploma
- Bachelor's degree
- Ph.D., M.D., J.D., or equivalent

VITA

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Hockett, K. S., and T. E. Hall. 1999. Shenandoah National Park Backcountry and Wilderness Visitor Survey. National Park Service, U.S. Department of the Interior, Shenandoah National Park.

Knotek, W. L., K. S. Hockett, and E. J. Pert. 1995. Interviewing, After Two Decades of Education, Don't Blow It Now. *Fisheries* 20:34-35.