

REDUCING AND UNDERSTANDING PETRIFIED WOOD THEFT AT PETRIFIED FOREST NATIONAL PARK

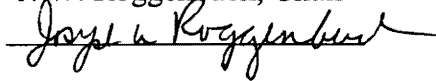
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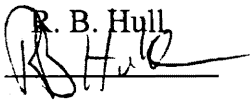
Carolyn J. Widner

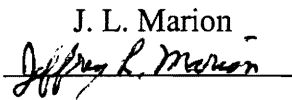
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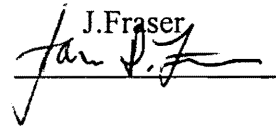
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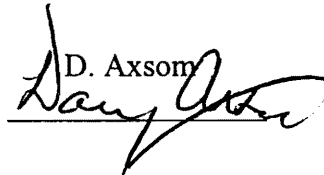
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**REDUCING AND UNDERSTANDING PETRIFIED WOOD THEFT
AT PETRIFIED FOREST NATIONAL PARK**

**by
Carolyn J. Widner
Joseph Roggenbuck, Chairman**

(ABSTRACT)

Depreciative behavior is a significant problem facing natural resource managers. The theft of petrified wood from Petrified Forest National Park is one type of depreciative behavior. Despite numerous anti-theft interventions, approximately 12 tons of wood disappear from the park each year. The focus of this study was to design, implement, and evaluate the effectiveness of interventions to reduce the theft of petrified wood. In addition to gaining a quantitative measure of intervention effectiveness, qualitative interviews were conducted to provide some contextual understanding of wood theft and of designed intervention effectiveness in reducing theft. Tested interventions included a sign, a signed pledge, and a uniformed volunteer.

A field experiment revealed a theft rate of 2.1% under the control condition. All three interventions significantly reduced the theft rate to about 1.4%. There was no difference in the effectiveness of the three tested interventions.

Subjective responses revealed that most theft was not a thoughtless act, but instead occurred because thieves rationalized their particular act of theft as acceptable. The primary rationalization given by thieves was that their piece of stolen wood was so small that taking it would not hurt anything. It appeared as though anti-theft messages were received by most of those interviewed, but that thieves only applied these messages to the larger pieces of wood. In addition, most thieves did not view taking a little chip as stealing. Interviews suggested visitors attended to the following aspects of the interventions: the desired behavior itself, the negative consequences of theft behavior, the visitors' responsibility for those consequences, the sanctions involved for the behavior, and visitors giving their word not to steal any wood from the park.

Dedication

To my mother, Patricia Widner, and my father, Clyde R. Widner, who gave me the roots that made me strong and the wings that gave me flight.

Acknowledgments

In any research effort, many people besides those directly involved with the data collection and analyses contribute to its successful completion. This was certainly the case with this study. I would first like to thank the National Park Service for funding this research and especially the staff at Petrified Forest National Park for making this study possible and pleasurable. I also appreciated the interest and the support of those staff members directly involved with the project.

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And finally, I acknowledge the unhiked trails have waited long enough, the dogs want to go for a walk, and the mountains call...

TABLE OF CONTENTS

LIST OF FIGURES	ix
LIST OF TABLES	x
CHAPTER I. GENERAL INTRODUCTION	1
Problem Statement: The Theft of Petrified Wood	2
Study Objectives	4
Dissertation Format	4
Overview of Study's Qualitative and Quantitative Methods	5
CHAPTER 2. A LITERATURE REVIEW	8
Controlling Depreciative Behavior in Parks	8
Causes of Depreciative Behavior in Parks	12
Theoretical Approaches to Behavior Change	18
The Study's Interventions	21
The Sign	22
The Pledge	29
The Uniformed Volunteer	33
Conclusion	36
CHAPTER 3. REDUCING THE THEFT OF PETRIFIED WOOD AT THE PETRIFIED FOREST NATIONAL PARK	37
Abstract	37
Introduction	38
Controlling Depreciative Behavior in Parks	40
Tests of Theory-Based Interventions	43
The Uniformed Volunteer	44
The Sign	46
The Pledge	51
Study Hypotheses	52
Methods	52
Study Site and Population	52
Study Design	53
Data Collection	53
Results	55
Discussion of Results	57
Management Implications	61
Research Implications	64

CHAPTER 4. UNDERSTANDING PARK VISITORS' RESPONSE TO INTERVENTIONS TO REDUCE PETRIFIED WOOD THEFT	69
Abstract	69
Introduction	70
The Literature Review	72
Causes of Depreciative Behavior in Parks	72
Controlling Depreciative Behavior in Parks	78
Methods	82
Study Site and Population	82
Sampling Design	82
Data Collection	83
Results	86
Visitor Reported Causes of Depreciative Behavior	87
Visitor Responses to Interventions	92
The Sign	93
The Pledge	96
Uniformed Volunteer	97
Conclusion	98
CHAPTER V. SUMMARY	102
LITERATURE CITED	105
APPENDIX A- INTERVIEW GUIDE	112
VITA	126

LIST OF FIGURES

Figure 2.1. The Interpretive Sign	23
Figure 2.2. The Signed Pledge	30
Figure 2.3. The Uniformed Volunteer	34
Figure 3.1. The Interpretive Sign	47

LIST OF TABLES

Table 3.1. Intervention Effectiveness	56
Table 4.1 Total number of interviews conducted during each experimental condition.	86
Table 4.2 Visitor responses of whether or not taking a small chip of wood is wrong	88
Table 4.3 Visitor responses to whether or not stealing wood from the gift shop is the same as stealing wood from the site.	91

CHAPTER I. GENERAL INTRODUCTION

The Petrified Forest National Park located in northeast Arizona has been protected since 1906 when Theodore Roosevelt set it aside to help preserve "the mineralized remains of Mesozoic forests" (USDI-NPS, 1992, p.3). When the area became a National Park in 1962 (P. L. 72-69), the management mandate of the National Park Service was re-emphasized to "conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations" (P.L. 39-535).

The Petrified Forest National Park contains abundant amounts of petrified wood estimated to be over 200 million years old. These Triassic fossils are clearly a nonrenewable resource that need protection. The park also contains invaluable paleontological and archeological resources. Aside from its enormous wealth of scientific information, the Petrified Forest National Park also contains some spectacularly beautiful landscapes including the Painted Desert, Blue Mesa, and the Tepees.

Although the park encompasses 93,533 acres, most visitor use is concentrated along the 27 mile road that connects the only two entrance/exit points. The north end of the road connects to I-40 and the south end to US Highway 180. The park can be considered a closed system in that the only access is via the two entrance/exit points, and these entry points are typically closed from 7:00 p.m. until 7:00 a.m.. There are no overnight facilities provided in the park. A few overnight users are allowed to stay in the

backcountry, and a permit is required. Aside from these infrequent backcountry visitors, after 7:00 pm the gates are closed and no visitor enters the park until 7:00 am the next morning.

Problem Statement: The Theft of Petrified Wood

The dual mandate of the National Park Service requires managers to protect the resource while simultaneously providing a place for public enjoyment. Easy access to artifacts and pieces of petrified wood that are scattered on the ground throughout the park, combined with visitor freedom to walk unobserved and unrestricted in the park, makes the dual mandate difficult to meet. Managers are faced with the challenge of controlling problem behavior (i.e., the removal of petrified wood), while still maintaining visitor freedom and enjoyment.

Visitor removal of petrified wood is, according to the park's General Management Plan (USDI-NPS, 1992), the area's primary resource protection problem. Managers consider resource loss due to visitors taking a small piece or two of petrified wood more devastating than loss due to commercial collectors. It is estimated that approximately 12 tons of petrified wood are removed from the park each year (USDI-NPS, 1992). For a resource that took millions of years to form, this estimated loss is not acceptable. However, because the resource is under the management of the National Park Service, "locking up" the resource is also not an option. Instead, management techniques must

attempt to promote the desired low-impact visitor behavior (i.e., not stealing petrified wood).

Throughout the years, the park has implemented a number of methods designed to deter wood theft. All visitors entering the park at either of the entrance/exit points are informed by park rangers that the removal of any artifacts within the park is illegal. Signs prohibiting the collection of artifacts at the entrance/exit points are in several languages. In addition, all visitors are also exposed to on-site signs with various anti-theft messages ranging from the threat of punishments and/or sanctions to the need to save the resource for future generations.

Aside from these interventions that should expose all visitors to anti-theft messages, there are two visitor centers at each end of the park that contain a wide array of interventions and anti-theft messages. A previous study indicates that over 50% of all visitors spend some time in one of the two visitor centers (Roggenbuck, Widner, & Stratton, 1997). Intervention techniques inside the visitor center include the following: a display with returned petrified wood and letters from the guilt-ridden thieves, a video of the history of the park and the need for protection, a myriad of brochures and written material, and interpretive rangers. The techniques used to reduce theft seem to approach the issue from appeals to the visitors' conscience, their pocketbooks (i.e., fines), their responsibility to future generations, and the scientific value of the resource.

Despite the myriad of interventions currently in place in the park, a study conducted in the summer of 1992 found an estimated 1.2% of visitors remove petrified

wood from the park (Roggenbuck, Widner, & Stratton, 1997). With an estimated visitation of 900,000 persons a year, and assuming the 1.2% that are thieves only take one piece of wood, an estimated 9,600 pieces of wood disappear each year.

Study Objectives

The purpose of this study is to design, implement, and assess the effectiveness of intervention techniques aimed at reducing petrified wood theft.

The specific study objectives are as follows:

1. Design effective and practical intervention techniques to reduce the theft of petrified wood from the Petrified Forest National Park.
2. Implement and evaluate the effectiveness of designed interventions to reduce the theft of petrified wood.
3. Conduct interviews with thieves and non-thieves to gain some contextual understanding into why visitors take wood and how interventions might inhibit the performance of that behavior.

Dissertation Format

This dissertation describes my attempt to understand and minimize the theft of petrified wood from the Petrified Forest National Park using a journal style format. This format includes two complete journal articles each with an introduction, literature review, study design, methods, results, and conclusion sections. The first article addresses study

objectives one and two, and article two deals primarily with objective three. These two articles are supported by the larger document which also includes comprehensive introduction, literature review, and conclusion chapters. The following is a list of all dissertation chapters:

- I. General introduction (study site, problem statement, study objectives, structure of the dissertation, and overview of study's qualitative and quantitative research methods).
- II. Literature Review (controlling depreciative behavior in parks, causes of depreciative behavior in parks, theoretical approaches to behavior change, theory-based interventions tested).
- III. Paper I (*Reducing the Theft of Petrified Wood from the Petrified Forest National Park*).
- IV. Paper II (*Understanding Park Visitors' Response to Interventions to Reduce Petrified Wood Theft*).
- V. Summary and Conclusions

Overview of Study's Qualitative and Quantitative Methods

This research incorporated the use of both quantitative and qualitative methods to assess the effectiveness of our designed interventions to reduce the theft of petrified wood from the park. Many research theorists indicate the incompatibility of qualitative and quantitative research methods and consequently may point out the incompatibility of the two methods being included in this research design (Cook & Reichardt, 1979; Bogdan &

Taylor, 1975; Taylor & Bogdan, 1984). The following brief discussion is given as support for approaching this research with both methods of data collection and analysis.

One of the primary arguments for this incompatibility is the difference that exists between the positivist and phenomenological paradigms. Assumptions of the world made by each paradigm are different and often in opposition, and therefore one study cannot simultaneously adopt both perspectives on the world. However, many have argued that the differences between the paradigms of positivism and phenomenology, do not necessarily mean that certain methods of data collection and analysis belong to one or the other of the world views (Reichardt & Rallis, 1994; Cook & Reichardt, 1979; Berg, 1995; Feldman, 1995). In fact, the logic of this argument leads to ideas of triangulation and the compatibility of both quantitative and qualitative methods as a way of addressing complicated social science questions (Bogdan & Biklen, 1992; Reichardt & Rallis, 1994).

Reichardt & Cook (1979) assert that there are three primary reasons for the inclusion of both methods in a single research design. First is the notion that social science often has two purposes: process and outcome. For this specific research issue, the outcome would be whether or not our interventions reduce the theft of petrified wood from the park. This question might be best answered through quantitative methods. However, the process aspect of the question concerns how or why our interventions may or may not be working. This question may be best addressed through qualitative research methods, or simply put, by asking the visitor in an open-ended format to describe his or her thoughts, feelings, and actions regarding the interventions and the theft decision.

Secondly, Reichardt & Cook (1979), suggest that two methods used together can build on one another and offer greater insights than either one alone could provide. “Quite simply, researchers cannot benefit from the use of numbers if they do not know, in common sense terms, what the numbers mean...ordinary science uses qualitative and quantitative knowing together to provide a depth of perception, or binocular vision, that neither one could provide alone” (p.23). In our case, we can determine if we can lower theft rates, and how or why our interventions might be working to accomplish that goal.

The third primary reason to include both quantitative and qualitative methods is related to the triangulation. As Reinhardt & Cook (1979) put it, “because all methods have biases, only by using multiple techniques can the researcher triangulate on the underlying truth” (p.21). In addition, the more disparate the methods, the greater the possibility of finding “truth”.

The above discussion was not to assert a philosophical perspective on research or paradigms, but to establish the accepted view that both approaches can be used successfully together. Given this view, this particular research design was to use quantitative methods to demonstrate if the interventions were effective and qualitative methods to gain some insight into why visitors were stealing the wood and how our interventions may or may not be effective in reducing that behavior.

CHAPTER 2. A LITERATURE REVIEW

Insight into appropriate and possibly effective methods to reduce petrified wood theft in a national park can be gained from park management literature on controlling depreciative behavior and from theories of human behavior change and social influence found in the social psychology, sociology, and psychology literature. There are several perspectives from which this literature addresses the issue of gaining compliance with rules and regulations, in this case, stopping the theft of petrified wood. One perspective is to consider what has been done in parks in the past to control depreciative behaviors. A second way to approach this review is to examine why depreciative behavior occurs in recreation areas. A third approach is to consider the broad theories of behavior influence found in social psychology, psychology, and sociology literatures. Finally, a fourth approach is to review the specific theories of human behavior upon which our tested interventions are based.

Controlling Depreciative Behavior in Parks

Considering the frequency and intensity of reported damage to parks as a result of depreciative behavior, it is surprising that so little empirical work has been done on methods for reducing such problem behavior. Compounding the difficulty of developing effective interventions is the inconsistency of the findings of the few studies that have been conducted. In addition, the variability of studied behaviors (e.g., theft, vandalism,

off-trail hiking, & littering) and tested interventions (e.g., signs, brochures, pledges, and uniformed officers) makes comparisons of results difficult.

For example, one logical way to examine these past studies is to consider the behaviors being influenced and the method of influence being tested. However, research has focused on the noncompliant behaviors of off-trail hiking (Johnson & Swearingen, 1992; Swearingen & Johnson, 1988), campsite impacts (Clark, Hendee, & Campbell, 1971; Dwyer, Huffman, & Jarratt, 1989; Fazio, 1979; Irwin, 1985; Oliver, Roggenbuck, & Watson, 1985), and littering (Christensen & Clark, 1983; Clark, Hendee, & Burgess, 1972; Iso-Ahola & Niblock, 1981; Muth & Clark, 1978). Only one study has been found that attempted to control the theft of paleontological resources in a park (Martin, 1992). In addition, methods of influence tested include interpretive signs with various text messages (Martin, 1992; Johnson & Swearingen, 1992; Swearingen & Johnson, 1988), symbolic signs (Johnson & Swearingen, 1992), verbal messages (Vander Stoep & Gramann, 1987), signed petitions (Iso-Ahola & Niblock, 1981), on-site uniformed presence (Oliver et al, 1985; Samdahl & Christensen, 1985), and brochures (Martin, 1992; Oliver et al, 1985). Because of this variability in the studied behaviors and the methods tested, results are difficult to compare. The following is a brief review of some of the studies conducted in natural resource areas to control depreciative behavior.

Martin (1992) examined the effect of four interventions, three types of trailhead signs and a brochure, on the theft of pumice from Mount St. Helens National Volcanic Monument. He found that, regardless of which intervention was in place, pumice

collection was reduced by at least two-thirds. The most effective method was a sanction sign that threatened prosecution for removing pumice. It reduced the theft rate to less than 1% of visitors to the park.

Johnson and Swearingen (1992) also reported the most effective sign message to deter off-trail hiking was a sanction message. They tested the effect of seven signs with differing messages on off-trail hiking in Mount Rainier National Park. They found that the sanction sign reduced off-trail hiking by 75%. In contrast, however, Clark et al., (1972) found the threats of sanctions or fines ineffective in controlling littering.

Some studies have suggested the type of sanction or warning used could make a difference in intervention effectiveness. For example, Schwartzkopf (1984) tested various sign texts on their ability to reduce the occurrence of feeding ground squirrels in Crater Lake National Park. He found that a sign warning of the negative consequences to the visitors from feeding the squirrels was twice as effective as a sign that told about the negative consequences of the behavior for the squirrels.

Other studies have examined the effect of educational brochures on depreciative behavior. Roggenbuck and Berrier (1982) successfully used an educational brochure to reduce camping levels at a heavily impacted meadow. A brochure also was successfully used to reduce the campsite impacts of littering and tree damage (Oliver, et al, 1985).

Vander Stoep and Gramann (1987) examined the effect of three different verbal messages on reducing depreciative behavior among youth groups at Shiloh National Military Park in Tennessee. One message conveyed the damaging consequences of

depreciative acts. The second message conveyed the negative consequences and also asked participants to help protect the resource. The third message conveyed the consequences, asked for help, and offered an incentive for helping. A field experiment revealed that all three messages were effective in reducing depreciative acts, but that they were not significantly different in effectiveness from each other.

Some studies have examined the effect of a uniformed presence on noncompliant behavior. In Swearingen & Johnson's (1988) study, off-trail hiking was decreased by using various sign messages including a sanction message, but the most effective method was the presence of a uniformed interpreter. Oliver et al. (1985) also found personal delivery of information by a uniformed volunteer to be the most effective method of deterring tree damage and litter. In contrast, other studies have found little to no increase in effectiveness of interventions due to personal contact (Neilson, 1981; Roggenbuck & Berrier, 1982). For example, Roggenbuck & Berrier (1982) tested the difference in the effectiveness of a brochure and a brochure plus personal contact on dispersing wilderness campers. They found inconsistency in the relative effectiveness of the brochure plus personal contact over the brochure treatment alone, which had a relatively more stable effectiveness. For example, they found that the brochure plus contact intervention was less effective for late arrivals than the brochure alone, but more effective than the brochure alone for novice campers and groups of 3 to 6 people.

This review of the literature on depreciative behavior studies in parks reveals the often conflicting results, and due to the variability that is introduced by testing different

interventions on site-specific behaviors, arriving at generalizable conclusions that can aid in the creation of effective behavioral interventions is difficult (Roggenbuck, Loomis & Dagostino, 1991; Vande Kamp et al., 1994).

Causes of Depreciative Behavior in Parks

A second way to examine the literature on depreciative behavior in parks is to consider what the causes for depreciative behavior are. When examining the research regarding why people perform depreciative behavior, three general philosophies or approaches emerged. Although these three approaches are not mutually exclusive, I will discuss them separately and identify some of the possible linkages where they exist. One general approach to why visitors perform depreciative behavior concerns failure to comply with social norms (Gramann & Vander Stoep, 1987; Heberlein, 1972; Samdahl & Christensen, 1985). Social norms are widely accepted shared beliefs about what behaviors are right or wrong in a given situation, and depreciative behavior could be considered as a violation of those norms.

Gramann and Vander Stoep (1987) developed a taxonomy of six norm violations. Some deviant behavior is “unintentional” and occurs because visitors are unaware of norms. Many others have agreed with this lack of “norm salience” or “knowledge” as a primary source of deviant behaviors (Christensen, 1986; Gramann, Christensen & Vander Stoep, 1992; Higgins, 1992; Martin, 1992; Oliver, Roggenbuck & Watson, 1985). For example, Martin (1992) and Oliver et al. (1985) demonstrated that regardless of the type

of educational intervention, exposure to an educational message significantly reduced depreciative behavior. In other words, simply increasing knowledge of the park rules apparently reduced the problem behavior.

A second category of depreciative behavior occurs because of conditions in the environment that promote or “cue” the depreciative behavior. The “releaser-cue” of seeing depreciative behavior stimulates the emergence of an otherwise inhibited behavior. For example, Samdahl & Christensen (1985) and Cialdini (1996) examined depreciative behavior as a product of visitors’ observations of existing depreciative behavior. Both studies found that depreciative behavior was more likely to occur in the presence of existing depreciative behavior. In addition, evidence of the problem behavior also lowered the effectiveness of their tested behavioral interventions.

The third reason for normative violations is that visitors may not know the consequences of the behavior or, as Gramann and Vander Stoep (1987) called it, are “uninformed violators.” In this case, visitors may know of the general rule or the norm for behavior but may not see its applicability to a particular act in the context of their visit to the park. In other words, they do not know the potential consequences of the behavior. Several studies have examined this idea that visitors may be performing noncompliant behaviors because of a lack of awareness of the consequences of the behavior (Christensen & Clark, 1983; Heberlein, 1972; Oliver et al., 1985; Schwartzkopf, 1984). For example, Schwartzkopf (1984) significantly reduced the visitors feeding squirrels using a messages that conveyed the possible consequences for such a behavior.

Some visitors that violate an existing norm may do so because they feel that, in their particular case, the violation is justified. Gramann & Vander Stoep (1987) called these “responsibility-denial” violators. In a study conducted by Roggenbuck and Berrier (1982) evidence of this type of violation can be seen. They successfully used an informational brochure to reduce camping levels at a heavily impacted meadow. However, when visitors received the message at near darkness, they were less likely to relocate to a less impacted site. This might be explained as a result of the perception that moving on to the next site was not a reasonable alternative given the late hour. Visitors may have been invoking the idea that “in this case” the violation is justified.

The fifth reason visitors may violate the norm is because of peer pressure, or as Gramann & Vander Stoep (1987) called it, “status-confirming” violations. These visitors are motivated to perform noncompliant behavior to conform to or please their referent group. In this case, the group’s reasons for performing the noncompliant behavior can be examined in terms of the other five types of deviant behavior. In fact, one review of vandalism suggested that a majority of depreciative behaviors occur as a direct result of group action (Vliet, 1992).

Gramann & Vander Stoep (1987) distinguished all of the above behaviors as deviant and different from their sixth type of violation which they called vandalism or “willful” violations. This type of violation could be motivated by financial gain, ideological protest, revenge, malice, or fun. These violators are “fully aware that their

actions are wrong, yet they persist because they are pursuing goals that are in fundamental conflict with the goal of resource protection” (p.250).

This idea that goals somehow influence or even cause depreciative behaviors is the second major approach taken in the literature to understand why visitors perform noncompliant behavior. Knopf and Dustin (1992) outline the motives behind depreciative behavior and vandalism in natural resource areas as a product of goals or needs. They contend that, “vandalism and depreciative behavior is need-driven behavior; it is neither senseless nor meaningless” (p.233).

There are three basic needs which, they suggest, promote the performance of depreciative behavior. One is the need for equity. This view contends that depreciative behavior results when rules or regulations are deemed unfair or unjust. Thus, when breaking the rule, visitors are attempting to fulfill the need for equity. This could easily be related to Gramann & Vander Stoep’s (1987) category “responsibility-denial” violations, where the visitor deems the rule unfair in their particular circumstance.

The second need they identify as driving depreciative and vandalistic acts is the need for competence. One aspect of this need may manifest itself in acts that demonstrate the individual’s control over themselves above and beyond what any rule may say. A second aspect of this need may be the performance of a depreciative act to gain status or support from a referent group. This can be easily linked to Gramann and Vander Stoep’s (1987) “status-confirming” violators. Here the referent group norm may serve to promote the vandalistic or depreciative behaviors.

A third need that drives much of the depreciative behavior in natural resource areas is arousal. Much of the literature on vandalism and depreciative behavior points to the role of entertainment or fun as a motivating force (Clark, Hendee & Campbell, 1971; Oliver et al., 1985). Gramann & Vander Stoep (1987) included fun as a motivating force promoting “willful” violations.

A third general approach articulated in the literature concerning why depreciative behavior occurs was first discussed by Hardin (1968) in his “Tragedy of the Commons” paper. This general view contends that depreciative behavior occurs in recreation areas because of basic human characteristics and common sense (Gramann, Christensen, & Vander Stoep, 1992; Meine, 1995; Vande Kamp, Johnson, & Swearingen, 1994). For example, the benefit from taking a chip of petrified wood accrues to the individual, while the cost of one less piece in the park is shared by all the visitors. It makes intuitive sense to the individual that the benefit of taking the wood is greater than the cost which is shared by everyone. This view contends that there is, in fact, a natural tendency for people to behave in this manner. People often operate to maximize reward and minimize costs. As with the previous discussion, this view of depreciative behavior can also be linked to the approaches presented above. For example, this approach could simply be viewed as need driven behavior and consequently linked to Knopf and Dustin’s (1992) discussion.

To demonstrate how the above perspectives could be used to interpret results of depreciative behavior studies conducted in recreation areas, the following three studies are

given as examples. In one study, Clark, Hendee and Campbell (1971) observed depreciative or vandalistic behavior in campgrounds and concluded that there were five primary reasons behind the performance of the behavior, i.e., entertainment, convenience, disregard for rules, ignorance of rules, and rules that interfered with goals. These can clearly be linked to both Knopf & Dustin's (1992) needs that drive depreciative behavior and Gramann & Vander Stoep's (1987) taxonomy of causes of depreciative behavior.

In another study, Martin (1992) examined the theft of pumice from Mount St. Helens National Monument and concluded that the theft was mainly occurring because visitors wanted a souvenir and/or wanted to share their experience with others. However, Martin (1992) reasoned, as Gramann and Vander Stoep (1987) might have, that this behavior could be occurring because visitors did not know about the norms (unintentional violators) or did not understand the negative consequences of violating the norm (uninformed violators).

In a study conducted in the Petrified Forest National Park, a survey revealed that thieves were more likely than non-thieves to act spontaneously to collect or purchase a souvenir (Roggenbuck, Widner & Stratton, 1997). This may reflect the lack of activation of the norm regarding theft or the expression of a need to get a souvenir.

It should also be noted that, in addition to the above perspectives on depreciative behavior, the fields of social psychology, psychology, and sociology can also be used to understand the causes of depreciative behavior. For example, attitude and attitude-activation theories (Fishbein & Ajzen, 1975; Johnson & Swearingen, 1992; Vincent &

Fazio, 1992), and moral reasoning theories (Dustin, 1985; Kohlberg, Levine & Hower, 1983; Stratton, 1995) have also been used to understand and explain depreciative behavior in natural resource areas. It is to these and other theories of behavior change that we now turn for a brief review of approaches taken.

Theoretical Approaches to Behavior Change

Another, and perhaps more meaningful, way of examining behavior change research is to consider the particular theory being tested. There are many theory-driven research programs designed to produce a desired behavior change from psychology's applied behavioral analysis to sociological deterrence theory. The fields of psychology, sociology, social psychology, and environmental psychology each provide several approaches and theories to understand, assess, and control behavior. Theories of behavior change range from those that consider behavior to be the product of mood or those that examine past experience as an antecedent to behavior to those that assess the impact of environmental prompts or sanctions on behavior. Some focus on attitudes and cognitive processes, while others do not address what happens in the mind of the individual. Within each field and each theory, assumptions are made ranging from the cognitive, rational nature of human beings to the view that behavior is a product of a myriad of social influences. Studies of visitor behavior have examined the issue through norm theories (Gramann, Christensen, & Vander Stoep, 1992; Noe, Hull, & Wellman, 1982; Schwartz, 1970), attitude-based theories (Fishbein & Ajzen, 1975; Johnson & Swearingen, 1992; Vincent

& Fazio, 1992), and moral reasoning theories (Dustin, 1985; Kohlberg, Levine, & Hower, 1983; Stratton, 1995).

Adding to the complexity of the situation is the fact that within any one theory many variables are thought to impact an individual. For example, within attitude-based approaches to behavior change, motivations, strength of held attitudes, behavior-attitude relationships and numerous other variables are thought to determine the effectiveness of intervention techniques (Eagly & Chaiken, 1993; Petty and Cacioppo, 1984; Vincent & Fazio, 1993). In other words, if a visitor has a particular attitude, and if the intervention primes the attitude, and if it is applicable to this situation, and if the visitor perceives control over the behavior, and if there is foreseeability of consequences.....,then it should work.

In addition, within any one intervention approach many theories may be at work. For example, the presence of a uniformed officer could invoke principles of normative social influence or informational social influence, or it could serve as a prime or discriminative stimulus. It could also activate the schema or personal norm that is consistent with compliance.

The range of factors that could be affecting behavior, even within one intervention strategy, is enormous (Johnson & Vande Kamp, 1994; Robinson, 1976). This is primarily because the causes of a single individual's behavior vary across time and place (Eagly & Chaiken, 1993). This is not to mention the variation that occurs across individuals. The

entire field of social psychology is built around the situational nature of behavior and the complex processes involved in understanding and influencing it.

Since research is filled with phrases such as, "under these conditions", "in this situation," and "if this, then that," in order to maximize the number of compliant visitors, the management technique used should maximize the incorporation of as many different theories as possible. Although I found no theoretical psychologist or social psychologist that suggests that a theoretical shotgun approach be used to change behavior, taken in total, the field itself seems to suggest that we use this approach. If we want to reach as many people as possible, and provided that the theoretical approaches do not contradict each other, this seems to be the logical route.

In fact, Vande Kamp et al. (1994), after a review of depreciative behavior studies in parks, recommended that due to the complexities of controlling noncompliant behavior, a multi-pronged approach should be used. Many have concluded that no one strategy will likely be found to effectively control all depreciative behaviors in parks (Christensen, 1986; Vande Kamp, et al., 1994). Johnson & Vande Kamp (1994) concluded that not only should multiple interventions be used but that "rather than adopting a single theoretical viewpoint, researchers should draw from as many theories as possible in searching for interventions to be tested" (p.A-4). In fact, Eagly & Chaiken (1993) concluded that "much greater breadth of theory can be achieved, particularly if investigators will allow themselves to take inspiration from a variety of domains of research" (p.693). In other words, the effectiveness of a single intervention strategy

should be increased by incorporating multiple theoretical underpinnings. For example, if norm appeals reach some people and attitudes can be used to influence others, a single intervention that includes both norm and attitude-based approaches should be more effective overall than any intervention based only on one approach or the other. Given all this, we decided to develop and test a shotgun approach in the construction of our interventions to reduce petrified wood theft.

The Study's Interventions

The following section attempts to shed some light on the underlying theories that were used to design each of the study's three interventions: the interpretive sign, the uniformed volunteer, and the signed pledge. The literature supporting each of the three interventions is covered separately beginning with a brief description of the intervention itself. This is followed by a review of some of the theories underlying different elements of the intervention and any relevant research that has been conducted.

Before we turn to an examination of the specific interventions, there is one element of social influence within which all three interventions are likely operating. Studies indicate that social influence factors, whether they are informational social influence or normative social influence factors, are more effective in affecting behavior if the situation is a novel one (Aronson, 1993; Fiske & Taylor, 1991; Tversky & Kahneman, 1974). On the other hand, elements like previously established behavior patterns and prior experience can make behavior changes difficult at best. The situation at Petrified

Forest National Park seems "prime" for effecting behavior change. For 94% of the visitors to the park, it is not the primary destination (Roggenbuck, Widner, & Stratton, 1997). In addition, the previous study also indicates that 75% of the visitors to the park are first time users. This suggests that involvement in the park visit may be low. In addition, it makes the situation a novel and ambiguous one that the literature identifies as an ideal situation for the influence of social pressure.

The Sign

The sign was approximately 4' x 5' and was placed less than two feet from the right side of the study site's trailhead. The sign contained both a visual and a text message (Figure 2.1). The visual message contained three photographs and a mirror. The photographs were across the top of the sign and depicted the progressive loss of petrified wood from 1965 to 1995. The last photo was bare ground devoid of petrified wood, and underneath the photo was a question mark. An additional visual message was a mirror that ran down the side of the sign next to the text.

We used several theories to develop each element of this intervention. In addition, elements may impact and affect individuals differently. This literature review provides a discussion of the theories used and some of the many possible explanations for visitor responses.

There are two primary schools of thought that suggested the location of the sign on the study site and next to the trail. There has been much debate and research regarding



Figure 2.1. The interpretive sign

the importance of proximal cues in shaping the nature of behavior (Aronson, 1992; Eagly & Chaiken, 1993). The field of social psychology is built, in part, on the belief that behavior is situational. Attempts at impacting behavior are more likely to be effective if they occur in proximity to the behavior itself. For example, the noncompliant behavior of stealing petrified wood may not stem so much from an intention to take wood, as it stems from the context of the proximal situation. Therefore, the sign was placed on the site where it would likely have the most impact.

In the subdiscipline of psychology called applied behavior analysis (ABA), the attempt is to directly manipulate behavior. These theories consider the sign to be a discriminative stimulus, or as Geller (1994) calls it, an activator. This activator serves to prime or prompt the desired behavior or stop the undesired behavior, in this case stealing petrified wood (Geller, 1994). ABA research indicates that signs are strong discriminative stimuli when the "temporal interval between message display and response opportunity is relatively short" (Geller, Koltuniak, & Shilling, 1983, p.29). Thus, ABA theories also point to the need to proximally locate the sign to the opportunity to perform the deprecative behavior.

The message begins with the title, "Someone is stealing petrified wood." This simple line incorporates many tactics shown to influence human behavior. By using the word "steal" instead of "remove" or "take", the message attempts to not only access the attitude that stealing is wrong but also make the attitude applicable in this situation. We are saying to visitors that taking petrified wood from the ground is stealing and is the

same as if they stole the piece from the shelves of the visitor center. Research on attitude accessibility demonstrates that the attitude must be accessed and also made applicable to the situation (Vincent & Fazio, 1992).

In addition, attitude research has suggested that persuasive messages should focus on the desired attitude that is specifically linked to the behavior rather than on general pro-park or pro-environmental attitudes (Vande Kamp, Johnson & Swearingen, 1994; Ajzen, 1988). Since behavior is attitudinally complex, priming the specific desired attitude should prove more successful than priming the general attitude of park protection (Eagly & Chaiken, 1995).

Once an attitude is primed many elements come into play to determine if it affects behavior. Two of these elements are responsibility for consequences and foreseeability of those consequences (Aronson, 1969; Eagly & Chaiken, 1993; Heider, 1958; Petty and Cacioppo, 1984; Latane & Darley, 1975). This literature prompted the inclusion of the message, "Only you can protect the park treasures. At the present time, 99% of all visitors DO NOT steal petrified wood. But 1% are thieves. One percent does not sound like much, but at this rate all of the wood would disappear in 15 years." This text serves the purpose of preventing the diffusion of responsibility and conveying what will happen if a visitor takes petrified wood (Eagly and Chaiken, 1993). Cooper and Fazio (1984) demonstrated that to prevent attitude-behavior discrepancies, subjects must be able to predict what will happen after a behavior and must be willing to accept responsibility for

those consequences. The text was written to tell visitors what will happen if they take wood.

The inclusion of the photographs was also prompted by the above theories. The photographs depict the progressive loss of wood over time with the last photo devoid of petrified wood and a question mark underneath the photo. This serves to visually convey the foreseeability of consequences of removing petrified wood, which the theory suggests is necessary for effective social influence. In addition, interpretive literature indicates that many visitors do not read interpretive signs (Hartley, 1997; Knudson, Cable, & Beck, 1995). These photos serve to convey, at a glance, the message, "petrified wood is disappearing", and more importantly they show what will happen if it continues. The mirror was included to help remind visitors that "they" are responsible for the consequences. As indicated above, this prevents the diffusion of responsibility that often undermines attitude-based social influence techniques (Eagly & Chaiken, 1993).

Research and theories on norms also give substantial justification for the inclusion of the above text. Research into personal norms indicates that messages that make visitors aware of the consequences of their behavior should help promote the behavior to be consistent with their norm regarding the behavior (Schwartz, 1970). Other normative research on injunctive and descriptive norms also supports the above text. Descriptive norms are those that tell us what others are doing and injunctive norms tell us what norm is socially accepted (Cialdini, 1996). Research conducted by Cialdini (1996) indicates that persuasive messages are more successful if injunctive and descriptive norms are in

agreement. Keeping with this theory, what we tell visitors to do, "do not steal even one small piece", is in agreement with the descriptive norm of what we say others are doing, "99% of all park visitors do not steal petrified wood".

Applied behavioral analysis (ABA) also prompts the inclusion of the descriptive norm of what others are doing, (i.e., "99% of all visitors DO NOT steal petrified wood"). In this case, the phrase serves two functions, one for mimicking behavior and the other as a discriminative stimulus (Eagly & Chaiken, 1994; Geller, 1989). Behavior analysts also support the statement, "Do not steal even one small piece." Geller (1989) states that one characteristic used to enhance a message is a specific description of the desired behavior.

The final part of the message is a sanction message. Although research about the success of interventions varies based upon the environment, the individual, and the theory, the overall effectiveness of a sanction message is one of the most consistent findings. The effectiveness of a sanction message in deterring noncompliance has been examined through ABA theories, attitude-behavior theories, deterrence theories, and moral reasoning theories.

Applied behavioral analysis theories have been used to examine the effectiveness of threats of fines and citations for controlling littering (Heberlein, 1971; Clark, Hendee & Burgess, 1972), illegal parking in handicapped zones (Jason & Jung, 1984), and off-trail hiking (Swearingen & Johnson, 1988). While the results for littering were inconsistent, both illegal parking and off-trail hiking were most affected by a message

that contained a sanction message (Vande Kamp et al, 1994). ABA would interpret this result as a product of the strong discriminative stimulus provided by the threat.

Attitude researchers could interpret the success of a threat as the result of priming or accessing the desired attitude (Eagly & Chaiken, 1993; Frieldand, 1976; Vincent and Fazio, 1992). The sanction messages are also considered by attitude research to fill the need of explaining the consequences of an action. As discussed above, foreseeability of consequences has been shown to affect whether or not an activated attitude is acted upon (Eagly and Chaiken, 1993; Latane & Darley, 1975).

Moral reasoning theories prompted the inclusion of two sanction messages, one addressing pre-conventional moral reasoning and the other higher levels of moral reasoning. Moral reasoning is believed to affect personal norms, which, in turn, are believed to impact behavior (Christensen & Dustin, 1989; Kohlberg, Levine, & Hower, 1983). Kohlberg's stages of moral development indicate that persuasive messages should be tailored to the stage of moral reasoning held by the target individual.

Since individuals at the park could be in any stage of moral development, it follows from the overall goal of this research that we include as many of them as possible. Individuals with pre-conventional moral reasoning are thought to only respond to messages that threaten punishment or promise rewards for behavior. Addressing those individuals is the message, "the minimum fine for petrified wood theft is \$275." The second sanction message included in the sign reads as follows, "the fine for future generations is far larger." This is a sanction message that has an ethical appeal designed

to reach those individuals in the conventional or post-conventional moral reasoning stages.

Deterrence theory also supports the inclusion of the sanction messages. This theory is built on the belief that noncompliant behavior can be controlled through sanctions. Relating to the above discussion of moral reasoning, deterrence theory would come into play in the pre-conventional stage of moral reasoning. Johnson and Swearingen (1992) found that a sign threatening a fine was twice as effective as any other sign message.

The interpretive sign layout was also informed by practical concerns. A recent study found that approximately 12% of visitors to the park are not from the US, and consequently may not be receiving the anti-theft messages currently existing in the park (Roggenbuck, Widner, & Stratton, 1997). The photographs provide a visual component that help break language barriers and reach more individuals than just the textual message alone. Even if visitors could not read the text and the dates, the photos indicate the uncertainty of the future existence of petrified wood in the park.

The Pledge

The second intervention was a signed pledge. When this intervention was in place, visitors were asked to volunteer to sign a pledge as they entered the park (Figure 2.2). The



Figure 2.2. The Pledge

pledge read, "I understand that petrified wood theft in the park is a problem. I agree not to take any wood from the park." Pledges were given at both entry points into the park. All individuals in each vehicle entering the park were asked to sign the pledge. Visitors were told the pledges would be displayed in the visitor centers.

As with the sign, this intervention can be examined through theories of attitude accessibility, norms, and applied behavior analysis. However, it is primarily supported by consistency and commitment theories.

Consistency and commitment theory begins with the view promoted by Festinger (1957) and Heider (1946) that a central motivator for behavior is the drive human beings have to be consistent. According to Cialdini (1993), both personal and interpersonal pressures prompt us to be consistent. Three main sources of pressure are identified by Cialdini (1993). First, consistency is valued by society and is often considered a sign of personal and intellectual strength. The second pressure to be consistent comes from the internal need to make sense of daily life. Without consistency our lives would quickly become disjointed and erratic. The cognitive complexities of modern life and decisions are the third pressure for humans to behave in a consistent manner. Being consistent with past actions and attitudes acts as a short-cut from cognitive consideration. In other words, it allows individuals to simply be consistent with past behaviors or what they said they would do without necessarily having to think about that behavior. The consistency principle is the vehicle through which compliance can be gained, but the key to start the process is commitment.

The key to the success of this intervention strategy is to get the visitor's commitment to help protect the resource and not take a piece of petrified wood. Promoting a visitor to go on record or take a stand that stealing petrified wood is wrong begins the process of automatic consistency with that statement. Research has demonstrated that written commitments are very powerful in promoting consistent behavior (Jones & Harris, 1967; Bem, 1972; Freedman & Fraser, 1966). Freedman and Fraser (1966) found that compliance with a request increased from 17 to 76 percent with a prior commitment. Once we elicit an active commitment, "I will not take any petrified wood from the park," then there is pressure for the visitor to be consistent with that statement.

For the commitment to be most effective in promoting the desired consistency, it should be active, public, and freely chosen (Cialdini, 1993). If the visitors perceive that they were free to write the statement (to make the initial commitment) and they believe others will see this statement, cognitive dissonance theory suggests that subsequent actions and behaviors will tend to be in line with the written declaration. People tend to "live up to what they have written down" (Cialdini, 1993, p. 67). To meet these requirements for success, visitors were free to decline signing the pledge, and were told the pledges would be displayed in the visitor center.

In a study conducted by Iso-Ahola and Niblock (1981) a commitment was found to reduce litter in a campground by 52%. These results could be interpreted in the above manner as a product of consistency and commitment pressures. However, demonstrating

the interconnectedness of much of the world of theory, this result could also be interpreted as a product of norms. Iso-Ahola and Niblock (1981) noted an interesting twist to their results. The commitment, or signing a petition agreeing not to litter, was only effective in a cleaner campground. Cialdini (1996) might suggest that this is the result of a discrepancy between descriptive and subjective norms. The injunctive norm that littering is unacceptable and wrong, which is emphasized through the petition, is undermined by the descriptive norm that everyone else is littering, which is evident in the littered campground. When the norms are in agreement, as in the cleaner campground, the intervention is successful.

Applied behavior analysis also suggests the success of a commitment to producing desired behavioral changes (Vande Kamp, et al, 1994; Geller, 1989; Geller, 1994).

Although the mechanisms used in this field to explain behavior change focus more on incentives or rewards and/or punishments, the results are similar. Research in this area has found pledges have been successful in increasing neighborhood recycling (Burn & Oskamp, 1986; Pardini & Katzev, 1984) and vehicle safety (Geller & Bigelow, 1984).

The Uniformed Volunteer

Our third intervention was an on-site uniformed volunteer. The uniformed volunteer wore a NPS volunteer shirt and hat and carried binoculars and a radio. The uniformed volunteer looked like a roving interpreter or a ranger (Figure 2.3). Theories supporting



Figure 2.3. The Uniformed Volunteer

the use of a uniformed presence on the site to reduce depreciative behavior include norm theories, deterrence theory, attitude theories, and applied behavior analysis.

Applied behavior analysis and deterrence theories consider the uniformed presence to serve as a discriminative stimulus. For example, just as a cop in the median strip serves to remind us that if we break the speed limit we get a ticket, the uniformed volunteer on site likely acts to strengthen the relationship that a particular behavior (i.e., stealing petrified wood) results in a particular consequence (i.e., getting a fine) (Geller, 1994; Vande Kamp, et al, 1994).

Attitude researchers would interpret the same phenomenon as a product of priming a visitor held attitude that "stealing" is bad (Johnson & Vande Kamp, 1994; Petty and Cacioppo, 1984; Schwartz, 1970; Vincent and Fazio, 1993). Norm research suggests that a uniformed volunteer intervention will be successful because it would serve to prime the existing norm regarding theft behavior (Cialdini, 1992; Eagly & Chaiken, 1993).

Research investigating the effects of a uniformed presence on site has demonstrated it to be one of the most effective methods tested (Vande Kamp et al, 1994). For example, Swearingen and Johnson (1988) found that a uniformed presence was more effective than any sign message or barrier in reducing off-trail hiking.

Swearingen and Johnson (1988) also point to the need to make an intervention, such as this one, economically practical. The uniformed personnel in their study were uniformed seasonal interpreters. Keeping with this recommendation, this study also

considers the budgetary constraints within which successful interventions must be found. Consequently, the uniformed presence was a volunteer.

Conclusion

In conclusion, this review provides theoretical and practical grounding for the three interventions tested in this research. In addition, the review also provides a foundation from which to examine the study, its methodology, results, and conclusions, which are provided in the following two journal articles. Although the research is applied and directed by the practical need to reduce wood theft, theories of behavior change and past intervention studies conducted in parks were used to inform and create interventions and to understand and interpret the subjective responses from the interviewees.

CHAPTER 3.
REDUCING THE THEFT OF PETRIFIED
WOOD AT THE PETRIFIED FOREST NATIONAL PARK

(Abstract)

The theft of petrified wood from the Petrified Forest National Park is the park's primary resource protection problem. Several interventions to control theft currently exist in the park and yet approximately 12 tons of wood are estimated to disappear from the park each year. This study evaluated three interventions to reduce the theft of wood from the park. Tested interventions included a sign, a signed pledge, and a uniformed volunteer. A field experiment revealed that all three interventions significantly reduced the theft of wood over control conditions. In addition, the interventions were not significantly different from each other in their effectiveness.

Introduction

Noncompliant visitor behavior is a significant problem facing natural resource managers. In a 1994 survey of national park superintendents, 72% of survey participants reported that noncompliance with rules and regulations by visitors caused significant damage to park resources (Johnson & Vande Kamp, 1994). The cost of damage was estimated in excess of 80 million dollars. About two-thirds of all managers reported noncompliant behavior that damaged cultural or historical sites or objects, or theft of paleontological or cultural objects. This damage is not easily quantified, in that once these resources are removed or destroyed they are not repairable.

Included in the category of nonrepairable damage is the removal of petrified wood from Petrified Forest National Park. Although this area did not become a national park until 1962, it has been protected since 1906 when Theodore Roosevelt set the area aside to protect "the mineralized remains of Mesozoic Forests" (USDI-NPS, 1992, p.3). These Triassic fossils, over 200 million years old, clearly represent a nonrenewable resource that once removed are gone forever. According to the park's General Management Plan (USDI-NPS,1992), visitor removal of petrified wood is the park's primary resource protection problem. Managers consider visitors that take a small piece or two of petrified wood more devastating to the resource than commercial collectors. They estimate that approximately 12 tons of petrified wood are removed from the park each year (USDI-NPS, 1992). Throughout the years, the park has implemented a number of methods designed to deter wood theft. All visitors entering the park at either of the entrance/exit

points are informed by park rangers that the removal of artifacts from the park is illegal. Signs prohibiting the collection of artifacts at the entrance/exit points are in several languages. In addition, all visitors are also exposed to on-site signs with various anti-theft messages ranging from the threat of punishments and/or sanctions to the need to save the resource for future generations.

These two interventions should expose all visitors to anti-theft messages. In addition, there are two visitor centers at each end of the park that contain a wide array of interventions and anti-theft messages. More than 50% of visitors spend some time in one of the two visitor centers (Roggenbuck, Widner & Stratton, 1997). Intervention techniques inside the visitor center include a display with returned petrified wood and letters from the guilt-ridden thieves, a video describing the history of the park and the need for protection, written material, and interpretive rangers. Thus techniques used approach the issue from appeals to the visitors' conscience, their pocketbooks (i.e., fines), their responsibility to future generations, and the scientific value of the resource.

Despite the myriad of interventions currently in place in the park, a study conducted in the summer of 1992 found an estimated 1.2% of visitors remove petrified wood from the park (Roggenbuck, Widner, & Stratton, 1997). With an estimated visitation of 900,000 persons a year, and assuming the 1.2% that are thieves only take one piece of wood, an estimated 9,600 pieces of wood disappear each year.

The primary purpose of the research reported here was to develop, implement, and test the effectiveness of various methods to deter the theft of petrified wood from the

park. More specifically, two general questions become pertinent for the research presented here. First, what interventions can we adopt in the park that are likely to be more effective than those which currently exist? Secondly, what research and multiple and diverse theories of human behavior can inform and improve our interventions? With respect to these questions, the following section briefly describes the literature on depreciative behavior in parks.

Controlling Depreciative Behavior in Parks

Considering the frequency and intensity of reported damage to parks as a result of depreciative behavior, it is surprising that so little empirical work has been done on methods for reducing such problem behavior. Compounding the difficulty of developing effective interventions are the variable nature of the few studies that have been conducted, and the inconsistency of the results produced by them. For example, the studied behaviors include off-trail hiking, tree damage, picnic table carving, feeding wildlife, and littering. In addition, a myriad of interventions have been tested on controlling depreciative behaviors including signs, petitions, uniformed officers, and brochures. Studies often produce conflicting results, and due to the variability that is introduced by testing different interventions on site-specific behaviors, arriving at generalizable conclusions that can aid in the creation of effective behavioral interventions is difficult. The following is a brief review of some of the studies conducted in natural resource areas that attempted to reduce depreciative behavior.

Martin (1992) examined the effect of four interventions, three types of trailhead signs and a brochure, on the theft of pumice from Mount St. Helens National Volcanic Monument. He found that all four methods reduced the occurrence of theft. The most effective method was a sanction sign that threatened prosecution for removing pumice. It reduced theft of pumice to less than 1% of park visitors. Johnson and Swearingen (1992) also reported the most effective sign message to deter off-trail hiking was a sanction message. In contrast, Clark et al. (1972), found threats of citations or fines ineffective in controlling littering.

Other research indicated that the type of sanction may make a difference in effectiveness. For example, Schwartzkopf (1984) tested various sign texts on their ability to reduce the occurrence of feeding ground squirrels in Crater Lake National Park. He found that a sign warning of the negative consequences to the visitors from feeding the squirrels was twice as effective as a sign that told about the negative consequences of the behavior for the squirrels.

Oliver, Roggenbuck, and Watson (1985) also demonstrated the effectiveness of a brochure on reducing depreciative behavior. However, they tested the brochure's effectiveness on reducing campsite impacts, and did not test the possibility of the increased effectiveness of a sanction sign, as did Martin (1992). They did, however, find increased effectiveness with personal delivery of the brochure. Martin (1992) did not test this method of delivery for his brochure.

Some studies have examined the effect of a uniformed presence on noncompliant behavior. In Swearingen & Johnson's (1988) study, off-trail hiking was decreased by using various sign messages including a sanction message, but the most effective method was the presence of a uniformed interpreter. Oliver et al. (1985), as discussed above, also found personal delivery of information by a uniformed volunteer to be the most effective method of deterring tree damage and litter. In contrast, other studies have found little to no increase in effectiveness of interventions due to personal contact (Neilson, 1981; Roggenbuck & Berrier, 1982). For example, Roggenbuck & Berrier (1982) reported wide variability in the effectiveness of rangers in influencing behavior and concluded that if the group was inexperienced or had 3 to 6 group members the ranger plus brochure intervention was more effective than the brochure alone in influencing behavior but that, if the group arrived late in the day, the personal contact plus brochure was not more effective than the brochure alone.

This brief review of the literature conducted in parks reveals the variety of the studies themselves, and of the subsequent results produced by them. The most prevalent finding from a review of these studies is that sometimes, for some individuals, for some behaviors, some interventions will work.

Tests of Theory-Based Interventions

Another, and perhaps more meaningful way, of examining behavior change research is to consider the particular theory being tested. Studies of visitor behavior have examined the

issue through norm theories (Gramann, Christensen, & Vander Stoep, 1992; Noe, Hull, & Wellman, 1982; Schwartz, 1970), attitude-based theories (Fishbein & Ajzen, 1975; Johnson & Swearingen, 1992; Vincent & Fazio, 1992), and moral reasoning theories (Dustin, 1985; Kohlberg, Levine, & Hower, 1983; Stratton, 1995). We can use these theories of behavior influence from social psychology, psychology, and sociology to inform the creation of our interventions. However, many complexities are found when attempting to shape behavior. For example, within attitude-based approaches to behavior change, such variables as motivations, strength of held attitudes, foreseeability of consequences, accepting responsibility for those consequences, and perceived freedom of choice are thought to determine the effectiveness of persuasion techniques (Chaiken & Eagly, 1993; Petty & Cacioppo, 1984; Swearingen & Johnson, 1988; Vincent & Fazio, 1992).

Vande Kamp et al. (1994), after a review of depreciative behavior studies in parks, recommended that due to the complexities of controlling noncompliant behavior, a multi-pronged approach should be used. Many have concluded that no one strategy will likely be found to effectively control all depreciative behaviors in parks (Christensen, 1986; Vande Kamp, Johnson, & Swearingen, 1994). Johnson & Vande Kamp (1994) concluded that not only should multiple interventions be used but that "rather than adopting a single theoretical viewpoint, researchers should draw from as many theories as possible in searching for interventions to be tested" (p.A-4). In fact, Eagly & Chaiken (1993) concluded that "much greater breadth of theory can be achieved, particularly if

investigators will allow themselves to take inspiration from a variety of domains of research" (p.693). In other words, the effectiveness of a single intervention strategy should be increased by incorporating multiple behavior influence techniques. For example, if norm appeals reach some people and attitudes can be used to influence others, a single intervention that includes both norm and attitude-based approaches should be more effective overall than any interventions based on any single approach.

Given the practical need of this research to design effective interventions to stop or significantly reduce the theft of petrified wood and the conflicting nature of intervention specific studies, using a shotgun approach to create theory-based interventions seems the logical choice to increase the potential applied effectiveness of each intervention. The following section provides a brief review of the tested interventions in this study and some of the behavior influence theories that suggest the potential success of each intervention.

The Uniformed Volunteer

One intervention tested in this study was an on-site uniformed volunteer. Research investigating the effects of a uniformed presence on-site has demonstrated it to be one of the more effective tested methods (Vande Kamp et al., 1994). For example, Swearingen and Johnson (1988) found that a uniformed presence was more effective than any sign message or barrier in reducing off-trail hiking. However, given budgetary constraints it is often not practical to place a salaried ranger on-site. As a result, we tested the effect of a

uniformed volunteer on visitor behavior. The uniformed volunteer wore a National Park Service volunteer shirt and hat and carried binoculars and a radio. She looked and acted much like a roving park ranger or interpreter.

Several supporting theories suggest the potential success of a uniformed volunteer intervention. The presence of a uniformed officer could invoke behavior change in a manner consistent with normative social influence theory, which contends that behavior is influenced by the expectations of others (Eagly & Chaiken, 1993). Normative research suggests that a uniformed volunteer intervention will be successful because it would serve to prime an existing norm regarding theft behavior (Eagly & Chaiken, 1993; Cialdini, 1993). For example, the intervention could activate the schema or the personal norm that stealing petrified wood is wrong (Schwartz, 1970). The uniformed presence could also serve as a prime for visitors' held attitudes that "stealing" is bad (Eagly & Chaiken, 1993; Johnson et al., 1994; Petty and Cacioppo, 1984).

Applied behavior analysis and deterrence theories consider the uniformed presence to serve as a discriminative stimulus. For example, just as a policeman in the median strip serves to remind us that if we break the speed limit we get a ticket, the uniformed volunteer on site likely acts to strengthen the belief that a particular behavior (i.e., stealing petrified wood) results in a particular consequence (i.e., getting a fine) (Geller, 1994; Vande Kamp, et al., 1994).

The Sign

The second intervention tested intervention was an interpretive sign (Figure 3.1). The sign was located next to the only trail entering the study site. On the top of the sign were three photographs depicting the progressive loss of petrified wood from 1965 to 1995. The third photograph was bare ground, and underneath the photo was a question mark indicating the uncertainty of how long the petrified wood would remain in the park. On the side of the sign was a mirror.

Several theories supported the design and placement of the sign. The location of the sign next to the entry point of the study site was suggested by research indicating that signs placed at or near the impact site are more effective than those further removed from the site (Fishbein and Manfredo, 1992; Geller, 1994; Vincent and Fazio, 1992).

In keeping with the theoretical shotgun approach, the sign incorporates attitude-behavior change theories, personal and injunctive normative theories, sanction messages, and ethical appeals which have all been shown to impact behavior (Eagly & Chaiken, 1993; Friedland, Thibaut and Walker, 1973; Schwartz, 1970).

Attitude research indicates that if interventions are to affect behavior through attitudes, the appropriate attitude must be primed and made applicable to the situation (Fishbein and Manfredo, 1992, Petty & Cacioppo, 1984; Vincent & Fazio, 1992). This



Figure 3.1. The Interpretive Sign

literature prompted the inclusion of the photographs and the use of the word "steal". The use of the word "steal" conveys to visitors that taking petrified wood from the ground is stealing and is similar to stealing wood from the shelves of the visitor center. The photographs visually convey the message that stealing petrified wood is harming the resource, thus making the primed attitude regarding theft applicable to this situation.

Once an attitude is primed, many elements come into play to determine if it impacts behavior. Two of these elements are responsibility for consequences and foreseeability of those consequences (Aronson, 1992; Eagly & Chaiken, 1993; Heider, 1958; Latane & Darley, 1975; Petty & Cacioppo, 1984). This literature prompted the inclusion of the message, "Only you can protect the park treasures. At the present time, 99% of all visitors DO NOT steal petrified wood. But 1% are thieves. One percent does not sound like much, but at this rate all of the wood would disappear in 15 years." This text serves the purpose of preventing the diffusion of responsibility and conveying what will happen if a visitor takes petrified wood (Eagly & Chaiken, 1993).

Cooper and Fazio (1984) demonstrated that to prevent attitude-behavior discrepancies, subjects must be able to predict what will happen after a behavior and must be willing to accept responsibility for those consequences. The text was written to tell visitors what will happen if they take wood, and the photographs were included to visually convey the same message. The mirror was also used to reinforce the visitors' responsibility for the consequences, thus helping to prevent the diffusion of responsibility.

Research on norms also supports the inclusion of the above text. Cialdini (1996) indicates that persuasive messages are more successful if injunctive and descriptive norms are in agreement. Keeping with this theory, what we tell visitors to do, e.g., "do not steal even one small piece" (injunctive norm), is in agreement with the descriptive norm of what we say others are doing, e.g., "99% of all park visitors do not steal petrified wood".

The final part of the message is a sanction message. The effectiveness of a sanction message in deterring noncompliant behavior has been examined through applied behavioral analysis theories, attitude-behavior theories, deterrence theories, and moral reasoning theories.

Applied behavioral analysis (ABA) theories have been used to examine the effectiveness of threats of fines and citations for controlling littering (Clark, Hendee & Burgess, 1972; Heberlein, 1971), illegal parking in handicapped zones (Jason & Jung, 1984), and off-trail hiking (Swearingen & Johnson, 1988). While the results for littering were inconsistent, both illegal parking and off-trail hiking were reduced the most by a message that contained a sanction (Vande Kamp et al., 1994). ABA would interpret this result as a product of the strong discriminative stimulus provided by the threat.

Attitude researchers could interpret the success of a threat as the result of priming or accessing the desired attitude (Eagly & Chaiken, 1993; Vincent and Fazio, 1992). The sanction messages could also be considered by attitude research to provide an awareness of the consequences of an action (Eagly & Chaiken, 1993; Latane & Darley, 1975).

Moral reasoning theories prompted the inclusion of two sanction messages, one addressing pre-conventional moral reasoning and the other addressing higher levels of moral reasoning (Christensen & Dustin, 1989; Kohlberg, Levine, & Hewer, 1983). Kohlberg's stages of moral development indicate that persuasive messages should be tailored to the stage of moral reasoning held by the target individual. For example, individuals in the pre-conventional stage of moral development will be more likely to change behavior in response to threats of punishment or promises of rewards than to ethical appeals. On the other hand, individuals in the post-conventional stages of moral reasoning will tend to be more responsive to ethical appeals.

Since individuals at the park could be in any stage of moral development, it follows from the overall goal of this research that we include as many stages as possible. Addressing individuals in the pre-conventional stage of moral reasoning is the message, "The minimum fine for petrified wood theft is \$275." The second sanction included in the sign reads as follows, "The fine for future generations is far larger." This is a sanction message that has an ethical appeal designed to reach those individuals in the post-conventional moral reasoning stage.

The Pledge

The third intervention tested was a signed pledge. When this intervention was in place, visitors were asked to voluntarily sign a pledge before entering the park. The pledge read, "I understand that petrified wood theft in the park is a problem. I agree not to take any

wood from the park." Pledges were given at both entry points into the park. All individuals in each vehicle entering the park were asked to sign the pledge. Visitors were told the signed pledges would be displayed in the visitor centers, thus visitors gave a freely written, public commitment.

This intervention was based primarily on consistency and commitment theories. According to Cialdini (1993), individuals have internal and external pressure to be consistent with commitments, especially if those commitments are made in public and in writing. Research has demonstrated that written commitments are very powerful in promoting behavior that is consistent with the commitment (Bem, 1972; Freedman and Fraser, 1966; Iso-Ahola & Niblock, 1981; Jones & Harris, 1967). People tend to "live up to what they have written down" (Cialdini, 1993, p.67).

In a study conducted by Iso-Ahola and Niblock (1981) a commitment was found to reduce litter in a campground by 52%. These results could be interpreted in the above manner as a product of consistency and commitment pressures. However, demonstrating the interconnectedness of much of the world of theory, this result could also be interpreted as a product of norms. Iso-Ahola and Niblock (1981) noted an interesting twist to their results. The commitment, or signing a petition agreeing not to litter, was only effective in a cleaner campground. Cialdini (1996) might suggest that this is the result of a discrepancy between descriptive and injunctive norms. The injunctive norm that littering is unacceptable and wrong, which is emphasized through the petition, is undermined by the descriptive norm that everyone else is littering, which is evident in the

littered campground. When the norms are in agreement, as in the cleaner campground, the intervention was successful.

Study Hypotheses

Based on past research, theories of behavior change, and the goals of this research, two study hypotheses are tested. First, the interventions should significantly reduce the theft rate over the control conditions. Secondly, since past research is inconclusive, the null hypothesis that the interventions will not be significantly different from each other in their effectiveness in reducing theft is also tested.

Methods

Study Site and Population

Since a 27-mile road traverses the park, and visitors are able to stop in a variety of places where wood is accessible, monitoring wood theft and the effectiveness of any interventions throughout the park was not possible. As a result, we chose one site to conduct this study.

Crystal Forest proved to be the best site for several reasons. First, Crystal Forest has large supplies of highly accessible petrified wood allowing for theft to occur. Secondly, Crystal Forest receives approximately 56% of all visitors to the park (Roggenbuck, Widner & Stratton, 1997). The site also provided places for discreet observation which was necessary for the study. Visitors to the study site during each

sampling period in the summer of 1995 were observed. One existing National Park Service anti-theft sign was located on the site throughout the entire study. It read, "Removal of petrified wood from the park is prohibited", and was located near the entrance to the Crystal Forest site, but not directly adjacent to the trail.

Study Design

A field experiment was conducted to determine the effectiveness of each intervention in reducing the theft of petrified wood. Each of the three interventions was randomly tested for ten days during the summer of 1995. A control period, where no tested intervention was in place, was also tested for ten randomly selected days. This resulted in 40 days of sampling. Each sampling day ran from 7:00 am until 2:30 pm with a half hour off for lunch at 11:30 am. Sampling was stopped at 2:30 pm to prevent fatigue among on-site observers.

Data Collection

Data collection was conducted using on-site field observation of behavior. On-site observation of the site, because of its size, required that the site be divided into two sections. Two observers worked each sampling day with one observer randomly assigned to each section of the site. A third observer, the counter, worked each sampling day to monitor use levels on the site. This enabled an accurate estimate of the theft rate. In this case, we have reported the number of thieves per 100 visitors to the site.

The field crew had two primary directives for observing thieves. First, all observers were to collect data in as unobtrusive a manner as possible. Observers dressed and acted like park visitors. Maintaining an unobtrusive presence was necessary to avoid any biasing effect of observation. For example, a visitor who discovered a pair of binoculars following him would be unlikely to steal petrified wood.

The second requirement was that observers must be certain that the person labeled as a thief was indeed a thief. Given the task of observing theft and assessing the interventions' effects on theft, this may seem an obvious requirement. However, once in the field, it became clear that many thieves were very good at stealing. Many times observers were almost positive a theft had occurred, but did not actually see the wood go into, for example, a pocket. This situation could result in errors in judgment on who was or was not a thief. We were especially concerned about the consistency or reliability of theft judgments across our field observers.

In order to reduce any variability in recorded thefts depending on observer, we took several precautionary measures. First, a theft was carefully defined as an act that begins with a visitor picking up petrified wood. If the visitor then placed the wood somewhere on herself or in any of her possessions, it was counted as a theft. Observers were instructed to be certain where the wood was as it left the site (e.g., in the left hand or in the front right pocket). In addition, observers were trained for three days during which cross-validation of the observation of acts of theft occurred among all observers. Finally, observers were stratified across all four observation conditions (i.e., the three

interventions and the control) so that they each observed an equal number of days for each condition.

Results

In order to determine the effectiveness of our designed interventions to reduce theft of petrified wood, an ANOVA *a priori* contrast was conducted (McCall, 1970; Nie, 1975). The contrast allows us to test the differences between specified means using a t statistic. In this case, we tested the difference between the control and the interventions. A contrast was used in lieu of an overall ANOVA because we predicted that the interventions will significantly lower the theft rate from the control condition. An overall ANOVA would simultaneously test for differences among the four means. However, this type of test is not appropriate since it averages the differences found between the four groups. For example, if a large difference existed between two means but the other means were not different, then output for the overall ANOVA may not be significant. In other words, an overall ANOVA may miss a significant relationship.

In addition, a contrast was used instead of individual t-tests because it is more powerful. It estimates within-group variability based on all groups in the analysis of variance, not just on the two groups involved in the comparison as in a simple t-test (McCall, 1970). Thus, to answer the primary question of whether or not the interventions were effective in lowering the theft rate, a contrast to compare all three interventions to the control was used.

Results of the contrast revealed that the interventions were significantly lower than the control at $p=.017$. In other words, the hypothesis that the interventions will significantly lower the theft rate below that of the control condition is accepted. Under the control condition, the theft rate was 2.1%. This rate of theft was significantly reduced to about 1.4% under the sign, the pledge and the uniformed volunteer interventions (Table 3.1).

Table 3.1. Intervention Effectiveness

Group	Number of sampling days	Total # of visitors	Total # of thieves	Mean Theft Rate
Control	10	5674	118	2.09
Uniformed Volunteer	10	5439	74	1.38
Interpretive Sign	10	5369	75	1.43
Signed Pledge	10	5596	80	1.41

ANOVA contrast: Control versus Interventions: significant difference at $p=.017$, $t\text{-value}=2.491$, $df=36$, standard error of the difference=.8198

No residual group difference unaccounted for (i.e., no difference among interventions was found)

Although the contrast tells us that there is a significant difference between the three interventions and the control, it does not tell us if there is any significant unaccounted for variance. Because the contrast simultaneously compares all three interventions to the control, we might be missing a significant difference among the interventions themselves. In other words, is there any residual between-group variance?

By examining the sums of squares and the mean squares of the two unaccounted for degrees of freedom (the contrast accounted for one), we determined that there was no remaining significant between-group variance unaccounted for by the original contrast (at $F_{obs} = .00910$, $df(2,36)$ and $F_{crit} = 2.86$). These results indicate that while each intervention reduced theft, the interventions themselves did not differ in effectiveness from each other. In other words, the null hypothesis is accepted. In fact, it is remarkable how similar the interventions were in effectiveness.

Discussion of Results

There are two primary findings of this study. The first finding indicates that each of the three interventions reduced wood theft. The second finding suggests that the interventions did not vary significantly in effectiveness from each other.

Given the existing low control level of theft of 2.1%, reducing the theft to 1.4% may not seem like much. However, given an estimated 900,000 visitors to the park each year, this reduction in theft equates to at least 6,000 pieces of wood not stolen each year. In addition, given the barrage of anti-theft messages aimed at visitors, it is very promising that the tested interventions reduced theft even further. To shed some light on why the interventions may be reducing theft, we turn to a brief discussion of each of the three interventions.

What is different about our sign from the existing sign on the site at Crystal Forest? Past research and theory suggests that our sign should be more effective for

several reasons. The existing National Park Service sign contains one written message. In addition, the message is general, "...removal of petrified wood is prohibited," and only targets those who may not know the norm or rule for behavior.

The interpretive sign tested in this research incorporated many theories of behavior change in addition to the norm message of the existing National Park Service sign. As indicated in the literature review, by increasing the amount of theoretical grounding of a single intervention, in this case a sign, we should increase its overall effectiveness. As with the existing sign, our sign contained a normative message, but we also located our sign at the entrance to the site, which should make it more effective (Aronson, 1992; Geller, 1994). In addition, our sign also contains a conventional and post-conventional moral reasoning anti-theft message.

Research also shows that persuasive messages should be specifically linked to the target behavior (Ajzen, 1988; Eagly & Chaiken, 1993; Vande Kamp et al., 1994). The existing National Park Service sign says, "Removal of petrified wood is prohibited". But why is it prohibited? Are all the little chips included in the warning? What happens if wood is taken? Our sign should be more effective because it conveys the specific behavior we desire, "Do not steal even one small piece". Secondly, we clearly, through text and visual photographs, communicate what will happen if just a few visitors steal wood. The foreseeability of consequences of a particular behavior is important if messages are to impact an individual's attitude toward the performance of that behavior

(Eagly & Chaiken, 1993; Latane & Darley, 1978). Our sign clearly tells visitors what will happen, "all of the wood would disappear in 15 years," if the behavior is performed.

Lastly, it is important that visitors not only be able to predict the consequences of an action, but that they also accept responsibility for those consequences (Chaiken & Eagly, 1993; Latane & Darley, 1975; Petty & Cacioppo, 1984). By using the text, "Only you can protect the park treasures," and the mirror, our sign attempts to convey to each visitor that he or she is responsible for the condition of the resource.

We also found that the uniformed volunteer was an effective method to reduce the theft of petrified wood. Research suggests that this intervention was successful because of the strong discriminative stimulus it provided (Geller et al., 1994; Vande Kamp et al., 1994). If we assume that most visitors to the park received the anti-theft message at the gate, then the success of a uniformed officer is due to the strong prime provided by her presence. She was present on-site throughout the period of the intervention, and she made herself visible by roving among visitors on the trail through the site. Whether the uniformed presence primes an existing norm regarding theft behavior or an attitude that "stealing" is bad is unclear. It could also be that her presence sends a pre-conventional sanction message, i.e., "if you steal wood, I will get catch and fine you". Although this is a message visitors may be receiving at the gate, the proximal presence of the uniformed officer may inhibit the performance of the prohibited behavior.

The effectiveness of the pledge intervention provides some interesting insights. While the other two interventions occurred on the study site, the pledge was more

removed in time and space from the study site. For example, some visitors entering the park on the north end may not have reached the study site for 3 or 4 hours. Much of the theory would suggest that for this reason, the pledge would not be as effective as the on-site uniformed officer. However, we found no difference in effectiveness among the tested interventions. The pledge, although not proximal in nature, required visitors not to take wood anytime while in the park. The findings of this study support the theory that freely written, public commitments can be effective in promoting compliance with the commitment (Cialdini, 1993; Freedman & Fraser, 1966; Iso-Ahola & Niblock, 1981).

As indicated above, we found no difference between the tested interventions. This is the second major finding provided by this study. For example, we found that a good interpretive sign can be as effective as an on-site uniformed volunteer. The incorporation of many theories of behavior change into our sign could be the reason for this finding.

Swearingen & Johnson (1988) found a uniformed officer to be more effective in deterring off-trail hiking than any sign text tested. However, examination of the texts they tested reveals each message conveyed only one primary persuasive message. For example, "Off-trail hikers may be fined," and "No Hiking-Meadow Repairs," were two signs they tested. Our sign may be as effective as a uniformed officer because it included many techniques shown to increase the effectiveness of persuasive messages. In any case, this finding is beneficial to managers who may not be able to place a uniformed presence on site, but who need to protect the resource.

Another possible reason for the similarity in effectiveness of the three interventions may be observer bias. In other words, the observers knew an intervention was in place and may have expected to see less theft and therefore observed less theft. However, this explanation does not seem plausible when considering the high variability of theft observations for each day between and within the interventions and the control. For example, during the control days, the number of observed thieves ranged from 5 to 22. When the pledge intervention was in place, the number of observed thieves ranged from 2 to 17.

Another possible explanation for the similar effectiveness of the interventions is found in the population itself. It could be, as some have indicated, that a certain percentage of noncompliant visitor behavior may be malicious and impossible to change (Vande Kamp et al., 1994). If this is the case, then perhaps 1.4% is the lower threshold of theft that we can possibly hope to reach, and any well-designed intervention could only lower theft to this level.

Management Implications

There are several management implications from this study. Management can achieve substantial reduction in theft without mandatory constraints on visitors. Secondly, this study indicates that a uniformed ranger may not be the most effective method for deterring noncompliant visitor behavior. This result could have been linked to the size of the study site and the subsequent inability of the uniformed volunteer to be seen by

everyone at the same time. It could also be because she was not a gun-toting ranger. However, the uniformed volunteer did significantly reduce theft. This is important information to managers, who, because of numerous constraints, may not be able to deploy a salaried uniformed presence on site. With damage to parks from noncompliant visitor behavior in the millions of dollars, this research provides effective and more importantly, practical alternative solutions.

One effective alternative suggested by this research is an interpretive sign. Since most parks are often littered with many existing signs, the implication that one more sign will make the difference may seem ludicrous. However, it does appear from this research that a single sign incorporating multiple messages theoretically grounded in a range of behavior change strategies can be as effective as a uniformed presence on the site. This is an exciting finding. Visitor motives for deviant behavior are numerous and building a single message that targets as many of those various visitor populations as possible will maximize the messages effectiveness. For example, some visitors will respond to an ethical message, while others will only respond to a threat of punishment. Therefore, an effective interpretive sign should include as many theoretically grounded appeals as possible.

In addition, an interpretive sign should be placed in proximal location to the opportunity to perform the targeted behavior. The inclusion of a visual message, in our case the photographs, should also increase a sign's effectiveness. Just as visitors vary in their individual responsiveness to interventions, they also vary in their attentiveness to

interventions. For example, some visitors only glance at a sign, while others carefully read every word. The inclusion of a visual message provides even those that only glance at the sign an anti-theft message.

The signed pledge tested in this study also provides an effective alternative management tool. This intervention has promising potential for one primary reason. It was as effective as the proximal interventions even though it was given off-site. Although the uniformed ranger and the sign were effective on-site, they could not possibly have been effective in stopping the theft of petrified wood prior to visitor exposure to them. However, the pledge, because it was given at the entrance station, could potentially have been reducing theft not just at the study site, but throughout the entire park.

With long lines building up at the entrance station, the prospect of giving a signed pledge at the gate may not seem to be an appealing or very practical intervention. However, an anti-theft message is already being given to all visitors entering the park and the substitution of the pledge as the anti-theft message would add only seconds to the overall contact time. If the result is the protection of thousands of pieces of petrified wood each year, benefits appear to outweigh inconvenience costs to park staff and visitors.

It is also important that the pledge be given freely and that visitors know it will be made public. Informing visitors that the pledges will be displayed somewhere, like a visitor center, makes the commitment a public one. In addition, the visitors must be

asked, not required, to sign the pledge. This voluntary commitment is apparently what produces the pressure for visitors to be consistent with the signed commitment, even when removed in time and space from where they signed the pledge. Training of contact personnel and practice giving a pledge should make it a practical and effective management alternative to reduce depreciative behaviors.

In summary, our research shows that managers can choose appropriate solutions depending on the situation without fear of sacrificing effectiveness. Creating single intervention techniques that incorporate a variety of theories should increase overall effectiveness. In other words, using theories of social influence, managers can construct site-specific and problem-specific interventions that should be effective.

Research Implications

This study has two primary implications for further research, one involving the findings and the other surrounding the theoretical approach taken in this study. This study leads to many questions of a practical nature. For example, was the pledge more effective for visitors who arrived at the study site sooner after signing the pledge rather than later? In other words, does the time elapsed between giving a commitment and the opportunity to display the relevant behavior affect consistency between the commitment and the behavior? For instance, will visitors that signed a pledge internalize the commitment as the theory suggests or is it self-limiting in space and/or time? Does a pledge to protect

park resources in the Petrified Forest National Park transfer over to other parks and other resources or is it limited to the place it was administered?

Another question related to the above issues involves the success of the pledge itself. Why, as an off-site intervention, was the pledge as successful as the on-site uniformed volunteer intervention? Maybe the uniformed officer was not as effective because she was merely a volunteer with no real gun-toting, rule-enforcing abilities. It could also have been the product of her gender. We did not test the effectiveness of a male uniformed volunteer. In addition, the study site itself was large and she may have had less success because some people simply did not see her on the site.

The success of our interpretive sign also has many research implications. Was there one primary effective message on the sign or was the success due to the combination of many theoretically grounded messages? This question might be answered by teasing apart and testing single theory-based messages and comparing their effectiveness to a single sign that combines the same messages. The existing National Park Service sign on the study site contained only a pre-conventional sanction message and the decreased theft rate found when our sign was in place suggests that combining several different theory-based messages in one sign increases effectiveness. However, increased effectiveness could have also been the result of an additional sign on site. For example, research on repeated exposure to messages would suggest that the effectiveness may have increased, not because of the particular message, but because of the mere presence of another sign on the site.

Another question concerns whether or not we would have decreased theft even further if we had implemented all three interventions simultaneously? If we conclude that one intervention with differing message approaches will be more effective than a single message, then perhaps several such shot-gun interventions would decrease theft even further. The results of testing all three interventions simultaneously might suggest whether or not the interventions are reaching different people or whether or not the lower limit of effectiveness has been reached.

This issue leads to the second primary implication for researchers, testing multiple-theory or "shotgun" approaches in the field. There are several reasons for and implications from a shotgun approach. A primary reason is the need to arrive at practical, effective solutions to current management problems. Most in this field agree that there is no single solution to a problem. Some theoretically based messages work for some people, some of the time, in some situations. Combining many theories into a single intervention should increase its overall effectiveness, thus addressing the immediate needs of the manager. Our research begins to confirm that multiple theory-based messages are effective and practical in the field. However, as previously noted, it is important that the approaches be compatible and not contradict each other in psychological appeal.

But to build even stronger interventions, and to know how and why each one works, we need to also break interventions down into their component parts. For example, was the most effective message the norm message or was it the pre-

conventional sanction message? Were visitors attracted to the sign by its size, location, or the photographs? Questions like these can be addressed by two primary methods. First, controlled lab experiments can be used to tease apart and test some of the single theoretical approaches and their differential effects on behavior. It is this type of work that often discovered and led to the incorporation of the various theoretically grounded messages in the first place, and it is through these controlled lab experiments that refinements can be made.

The second research approach is suggested by the above discussion. If theories found in the lab are to be understood and tested in the field, there is a need to simultaneously conduct more qualitative in-depth research in the field. Understanding the processes that may be affecting visitors behavior may be gained from the visitors themselves. In this case, in-depth interviews from thieves and non-thieves could lend more understanding to which theories may be impacting behavior and why. For example, asking visitors what they remember about the sign could suggest what messages may have been impacting them the most. Comparing the subjective responses of thieves and non-thieves could have implications for theory development. In this manner, we can combine deduction to create interventions from existing research and theory with induction from qualitative interviews to refine and possibly even build new theories.

In summary, pursuit of a theoretical understanding of a problem is important and can be had in research that is directed by an applied need to solve a problem. As Eagly & Chaiken (1993, p.695) concluded, "Because of many uncertainties that researchers face in

trying to apply existing theories, exploratory research in the applied setting is generally essential to problem solving in the environment." This research demonstrates that we can use our knowledge of theory and of successful management to help build theoretically sound and practically effective interventions.

CHAPTER 4.
UNDERSTANDING PARK VISITORS' RESPONSE
TO INTERVENTIONS TO REDUCE PETRIFIED WOOD THEFT

(Abstract)

This study examined why theft of petrified wood at Petrified Forest National Park occurred and how designed interventions worked to inhibit the performance of that behavior. This evaluation was based on semi-structured interviews with observed thieves and non-thieves. Subjective responses revealed that theft was not a thoughtless act, but instead occurred because thieves rationalized that their particular act of theft was acceptable. The primary rationalization given by thieves was that their piece of stolen wood was so small that taking it would not hurt anything. It appeared as though anti-theft messages were received by all of those interviewed, but that thieves only applied these messages to the larger pieces of wood. In addition, most thieves did not view taking a little chip as stealing. The primary messages received from the interventions were the desired behavior itself, the negative consequences for the behavior, the visitors' responsibility for those consequences, the sanctions involved for the behavior, the activation of the attitude that taking little chips was stealing, and visitors giving their word not to steal any wood from the park. This gives contextual support for the inclusion of several behavior change strategies into any one intervention.

A visitor at Petrified Forest National Park reaches down and picks up a small piece of petrified wood. After careful examination, the visitor places the wood back where it was found. A few minutes later, at the same site, a second visitor picks up a small chip of wood. After careful examination, she puts the chip in her pocket. Why did one visitor take the wood and the other carefully replace it? Can we design interpretive interventions to stop the second visitor from taking the chip of wood? And if so, how does it stop her?

Introduction

Noncompliant visitor behavior, such as the theft of the nonrenewable resource petrified wood, is a significant problem facing natural resource managers today. In a 1994 survey of national park superintendents, 72% of survey participants reported that noncompliance of rules and regulations by visitors caused significant damage to park resources. (Johnson, & Vande Kamp, 1994). The managers estimated the cost to repair accumulated damage to National Park Service areas to be \$79.2 billion (Johnson and Vande Kamp, 1994). The estimate of the *annual* costs of “fixing” resources and facilities damaged by such inappropriate behavior was \$18.8 million. These costs, while high, do not include the large social and environmental costs of non-repairable resource damage. For example, once petrified wood is removed from a park or stalactites are broken in a cave, money cannot fix them. In Petrified Forest National Park in northeast Arizona, visitor removal

of petrified wood is the park's primary resource protection problem (USDI-NPS, 1992).

In fact, park staff estimate that approximately 12 tons of wood are removed each year.

Considering the frequency and intensity of reported damage to parks as a result of depreciative behavior, it is surprising that so little work has been done on attempting to understand such problem behavior. The few studies that have been conducted on depreciative behavior in natural resource areas have mostly been site-specific attempts to control or reduce the performance of the behavior (Gramann & Vander Stoep, 1987; Martin, 1992; Johnson & Swearingen, 1992; Oliver, Roggenbuck, & Watson, 1985; Roggenbuck, Loomis & Dagostino, 1991). Few attempts to understand the behavior exist, and they mostly involve conjecture on what may or may not be happening based on the application of a particular theory (Roggenbuck, Loomis, & Dagostino, 1991). Consideration of how or why an intervention may or may not be working is almost nonexistent. In addition, no attempts to understand depreciative behavior from the perspective of those committing the acts was found.

The primary purpose of the research presented here was to begin to develop a richer understanding of the depreciative behavior of petrified wood theft. More specifically, we attempted to understand why some park visitors steal wood, and how various interventions shape appropriate or inappropriate behavior? The approach we took was to look at these issues from the perspective of the park visitor.

The Literature Review

Causes of Depreciative Behavior in Parks

Most research has focused on the noncompliant behaviors of off-trail hiking (Johnson & Swearingen, 1992; Swearingen & Johnson, 1988), campsite impacts (Clark, Hendee, & Campbell, 1971; Dwyer, Huffman, & Jarratt, 1989; Fazio, 1979; Irwin, 1985; Oliver, Roggenbuck, & Watson, 1985), and littering (Christensen & Clark, 1983; Clark, Hendee, & Burgess, 1972; Iso-Ahola & Niblock, 1981; Muth & Clark, 1978). Only two studies were found that dealt with the theft of a resource and the subsequent attempts to reduce that behavior (Martin, 1992; Roggenbuck, Widner, & Stratton, 1997).

When examining the published literature regarding why people perform depreciative behavior, three general philosophies or approaches emerged. Although these three approaches are not mutually exclusive, we will discuss them separately and identify some of the possible linkages where they exist. One general approach to explain why visitors perform depreciative behavior concerns failure to comply with social norms (Gramann & Vander Stoep, 1987; Heberlein, 1972; Samdahl & Christensen, 1985). Social norms are widely accepted shared beliefs about what behaviors are right or wrong in a given situation, and depreciative behavior could be considered as a violation of those norms.

Gramann and Vander Stoep (1987) developed a taxonomy of six norm violations. Some deviant behavior is “unintentional” and occurs because visitors are unaware of norms. Many others have agreed with this lack of “norm salience” or “knowledge” as a

primary source of deviant behaviors (Christensen, 1986; Gramann, Christensen & Vander Stoep, 1992; Higgins, 1992; Martin, 1992; Oliver, Roggenbuck & Watson, 1985). For example, Martin (1992) and Oliver et al. (1985) demonstrated that regardless of the type of educational intervention, exposure to an educational message significantly reduced depreciative behavior. In other words, simply increasing knowledge of the park rules apparently reduced the problem behavior.

A second category of depreciative behavior occurs because of conditions in the environment that promote or “cue” the depreciative behavior. In other words, the “releaser-cue” of seeing depreciative behavior stimulates the emergence of an otherwise inhibited behavior. For example, Samdahl & Christensen (1985) and Cialdini (1996) examined depreciative behavior as a product of visitors’ observations of existing depreciative behavior. Both studies found that depreciative behavior was more likely to occur in the presence of existing depreciative behavior. In addition, evidence of the problem behavior also lowered the effectiveness of their tested behavioral interventions.

A third reason for normative violations is that visitors may not know the consequences of the behavior or, as Gramann and Vander Stoep (1987) called it, are “uninformed violators”. In this case, visitors may know of the general rule or the norm for behavior but may not see its applicability to a particular act in the context of their visit to the park. Several studies have examined this idea that visitors may be performing noncompliant behaviors because of a lack of awareness of the consequences of the behavior (Christensen & Clark, 1983; Heberlein, 1972; Oliver et al., 1985; Schwartzkopf,

1984). For example, Schwartzkopf (1984) significantly reduced the frequency of visitors feeding squirrels using a message that conveyed the possible consequences for such a behavior.

Some visitors that violate an existing norm may do so because they feel that, in their particular case, the violation is justified. Gramann & Vander Stoep (1987) called these “responsibility-denial” violators. In a study conducted by Roggenbuck and Berrier (1982) evidence of this type of violation can be seen. They successfully used an informational brochure to reduce camping levels at a heavily impacted meadow. However, when visitors received the message at near darkness, they were less likely to relocate to a less impacted site. This might be explained as a result of the perception that moving on to the next site was not a reasonable alternative given the late hour. Visitors may have been invoking the idea that “in this case” the violation is justified.

The fifth reason visitors may violate the norm is because of peer pressure, or as Gramann & Vander Stoep (1987) called it, “status-confirming” violations. These visitors are motivated to perform noncompliant behavior to conform to or please their referent group. In fact, one review of vandalism suggested that a majority of depreciative behaviors occur as a direct result of group action (Vliet, 1992).

Gramann & Vander Stoep (1987) distinguished all of the above behaviors as deviant and different from their sixth type of violation which they called vandalism or “willful” violations. This type of violation could be motivated by financial gain, ideological protest, revenge, malice, or fun. These violators are “fully aware that their

actions are wrong, yet they persist because they are pursuing goals that are in fundamental conflict with the goal of resource protection” (p.250).

The idea that goals somehow influence or even cause depreciative behaviors is the second major approach taken in the literature to understand why visitors perform noncompliant behavior. Knopf and Dustin (1992) outline the motives behind depreciative behavior and vandalism in natural resource areas as a product of goals or needs. They contend that, “vandalism and depreciative behavior is need-driven behavior; it is neither senseless nor meaningless” (p.233).

There are three basic needs which, they suggest, promote the performance of depreciative behavior. One is the need for equity. This view contends that depreciative behavior results when rules or regulations are deemed unfair or unjust. Thus, when breaking the rule, visitors are attempting to fulfill the need for equity. This could easily be related to Gramann & Vander Stoep’s (1987) category “responsibility-denial” violations, where the visitor deems the rule unfair in their particular circumstance.

The second need they identify as driving depreciative and vandalistic acts is the need for competence. One aspect of this need may manifest itself in acts that demonstrate the individuals’ control over themselves above and beyond what any rule may say. A second aspect of this need may be the performance of a depreciative act to gain status or support from a referent group. This can be easily linked to Gramann and Vander Stoep’s (1987) “status-confirming” violators. Here the group norm may serve to promote the vandalistic or depreciative behaviors.

A third need that drives much of the depreciative behavior in natural resource areas is arousal. Much of the literature on vandalism and depreciative behavior points to the role of entertainment or fun as a motivating force (Clark, Hendee & Campbell, 1971; Oliver et al., 1985). Gramann & Vander Stoep (1987) included fun as a motivating force promoting “willful” violations.

A third general approach articulated in the literature concerning why depreciative behavior occurs was first discussed by Hardin (1968) in his “Tragedy of the Commons” paper. This general view contends that depreciative behavior occurs in recreation areas because of basic human characteristics and common sense (Gramann, Christensen, & Vander Stoep, 1992; Meine, 1995; Vande Kamp, Johnson, & Swearingen, 1994). For example, the benefit from taking a chip of petrified wood accrues to the individual, while the cost of one less piece in the park is shared by all the visitors. In other words, it makes intuitive sense, to the individual, that the benefit of taking the wood is greater than the cost which is shared by everyone. This view contends that there is, in fact, a natural tendency for people to behave in this manner. As with the previous discussion, this view of depreciative behavior can also be linked to the approaches presented above. For example, this approach could simply be viewed as the expression of a need to acquire benefits for the individual over what any rule may say about the costs for others, and thus linked to Knopf and Dustin’s (1992) discussion of need’s driven behavior..

To demonstrate how the above perspectives could be used to interpret results of depreciative behavior studies conducted in recreation areas, the following three studies

are given as examples. In one study, Clark, Hendee & Campbell (1971) observed depreciative or vandalistic behavior in campgrounds and concluded that there were five primary reasons behind the performance of the behavior: entertainment, convenience, disregard for rules, ignorance of rules, and rules that interfered with goals. These can be linked to both Knopf & Dustin's (1992) needs that drive depreciative behavior and Gramann & Vander Stoep's (1987) taxonomy of causes of depreciative behavior.

In another study, Martin (1992) examined the theft of pumice from Mount St. Helens National Monument and concluded that the theft was mainly occurring because visitors wanted a souvenir and/or wanted to share their experience with others. Martin (1992) reasoned, as Gramann and Vander Stoep (1987) might have, that this behavior could be occurring because visitors did not know about the norms (unintentional violators) or did not understand the negative consequences of violating the norm (uninformed violators).

In a study conducted in Petrified Forest National Park, a survey revealed that thieves were more likely than non-thieves to act spontaneously to collect or purchase a souvenir (Roggenbuck, Widner & Stratton, 1997). This may reflect the lack of activation of the norm regarding theft or the expression of a need to get a souvenir.

It should also be noted that in addition to the above perspectives on depreciative behavior, the fields of social psychology, psychology, and sociology can also be used to understand the causes of depreciative behavior. For example, attitude and attitude-activation theories (Fishbein & Ajzen, 1975; Johnson & Swearingen, 1992; Vincent &

Fazio, 1992), and moral reasoning theories (Dustin, 1985; Kohlberg, Levine, & Hewer, 1983; Stratton, 1995) have also been used to understand and explain depreciative behavior in natural resource areas. This review of the literature was not meant to assert one interpretation of why visitors perform depreciative behavior over another but simply to provide a background to aid us in interpreting visitors' reasons for taking petrified wood.

Controlling Depreciative Behavior in Parks

The second key question we addressed in this study is how and why behavioral interventions work to reduce depreciative behavior in parks. Past research on this issue has most often attempted to find answers in atheoretical experimental or quasi-experimental field tests of a series of similar, but slightly different interventions, or through the application of social-psychological, sociological, and psychological theories of persuasion and behavior change. Methods of influence tested include interpretive signs with various text messages (Martin, 1992; Johnson & Swearingen, 1992; Widner & Roggenbuck, 1998), symbolic signs (Swearingen & Johnson, 1988), verbal messages (Vander Stoep & Gramann, 1987), signed petitions (Iso-Ahola & Niblock, 1981; Widner & Roggenbuck, 1998), on-site uniformed presence (Oliver et al, 1985; Samdahl & Christensen, 1985; Widner & Roggenbuck, 1998), and brochures (Martin, 1992; Oliver et al, 1985). Studies of depreciative behavior in recreation areas have attributed intervention success to education or the simple conveyance of the desired behavior

(Christensen, 1986; Knopf & Dustin, 1992; Oliver et al, 1985; Swearingen & Johnson; 1988; Vander Stoep & Gramann, 1987), activating feelings of moral responsibility (Gramann & Vander Stoep, 1987; Heberlein, 1972), promising rewards or threatening sanctions (Martin, 1992; Schwarzkopf, 1984; Widner & Roggenbuck, 1998), making visitors aware of the negative consequences of the behavior and their responsibility for those consequences (Christensen & Clark, 1983; Heberlein, 1972; Johnson & Swearingen, 1992; Widner & Roggenbuck, 1998), and exposing visitors to uniformed personnel (Oliver et al. 1985; Samdahl & Christensen, 1985; Widner & Roggenbuck, 1998).

For example, Martin (1992) examined the effect of four interventions, three types of trailhead signs and a brochure, on the theft of pumice from Mount St. Helens National Monument. Regardless of which intervention was in place, the amount of pumice collected was reduced by at least two-thirds. The most effective method was a sanction sign that threatened prosecution for removing pumice. He suggests the effectiveness of all of the interventions was probably due to the conveyance of an unknown rule, and that the added success of the sanction sign was because of the communication of the consequences of performing the behavior.

Vander Stoep and Gramann (1987) examined the effect of three different verbal messages on reducing deprecative behavior at Shiloh National Military Park. The three messages tested were an awareness of consequences message (AC), the AC message plus a resource protection message (RP), and the AC and RP messages plus an incentive for

helping to protect the resource. They found that all three messages significantly reduced the occurrence of depreciative acts, and the messages did not significantly differ in effectiveness from each other. They suggested the similar effectiveness of the three messages was probably due to the fact that the violations were primarily unintentional, releasor-cue, or uninformed in nature, and therefore, conveying the consequences for the behavior is often sufficient in bringing about a behavior change.

Oliver et al. (1985) tested the effect of an educational brochure, the brochure plus personal contact, and the brochure, contact, and a request to assist in rule enforcement on reducing depreciative campsite impacts. They found that regardless of whether or not the educational message was delivered in person or through the brochure alone, it reduced litter and tree damage by 50%. They also found the most effective method to be the brochure plus contact, which reduced depreciative acts by 80%. They explained that the overall success of an educational approach was probably due to increasing the awareness of the rule or the norm for behavior and of the consequences of depreciative behavior. The increased effectiveness when the uninformed interpreter delivered the brochure can be explained by the application of several theories. For example, the interpreter could have made more salient the norms for behavior, caused fear of getting caught for performing depreciative acts, given the brochure more credibility, or simply increased the chances that the brochure was read. However, the result could also have been the product of consistency and commitment theories. When the uninformed interpreter gave the brochure to visitors, she asked for their cooperation in alleviating the problem of depreciative

behavior. If visitors agreed to do this, it could have served to promote internal pressure to be consistent with the commitment they made to the interpreter (Cialdini, 1993). In other words, increased compliance would have resulted because visitors gave their word to do so. However, without asking the visitors, we have no way of knowing why compliance increased with the personal delivery of the brochure.

In a study conducted in Petrified Forest National Park, three interventions were created to control the theft of petrified wood from the park (Roggenbuck, Widner & Stratton, 1997). Interventions included a sign, a signed pledge, and a uniformed volunteer. All three interventions significantly reduced the theft of petrified wood, and the three interventions did not differ in effectiveness from each other. These interventions were believed to have been successful due to the theoretical shotgun approach used to create the interventions. For example, theories indicate that norm appeals will reach some people and threats of punishment can be used to influence others. Given this, a single intervention that incorporates both of them should be more effective than any one intervention based only on one approach or the other. For example, the sign tested was believed to have been successful because it incorporated a visual and a written anti-theft message that included the rule itself, appeals to the conscience, threats of punishment, norm appeals, the negative consequences of the behavior, and the visitors' responsibility for the consequences.

In summary, while there have been site-specific tests of intervention effectiveness in reducing or controlling depreciative behavior, given the variability of studied

behaviors, the myriad of intervention techniques tested, and the atheoretical nature of many of the studies, it is difficult to know how or why our interventions are working or not working. In addition, without subjective responses from those committing acts of depreciative behavior, we know very little about how visitors processed these interventions and why or why not subsequent behavior changed. Are our conclusions drawn from theories of depreciative behavior congruent with what is going on in the minds of those committing the acts? This research is designed to help address that question.

Methods

Study Site and Population

The study was conducted at Crystal Forest, a site along the 27-mile road that traverses Petrified Forest National Park. It provided large supplies of accessible petrified wood allowing for theft to occur, had high visitor usage, and offered places for discreet observation of behavior. The study population consisted of visitors at Crystal Forest during the sampling periods of the summers of 1995 and 1996.

Sampling Design

This study was conducted simultaneously with research cited earlier by Roggenbuck, Widner and Stratton (1997) designed to test the effectiveness of a sign, a signed pledge, and a uniformed volunteer on the theft of petrified wood (See article 1 of this document

for a full review). Each of the three interventions was randomly tested for ten days during the summer of 1995. A control period was also tested for ten randomly selected days. Each sampling day ran from 7:00 am until 2:30 pm. Interviews were conducted during each of the four experimental conditions. However, ten additional sampling days had to be conducted in the summer of 1996 in order to gain an interview from at least three observed thieves during each of the four experimental conditions.

Data Collection

In-depth semi-structured interviews were used to collect the data. Interviewees were purposefully sampled based on whether or not they were an observed thief, and which intervention was in place at the time of the behavior. In other words, interviews were sought from thieves and non-thieves during each of three interventions and the control condition to determine if any differences existed in subjective responses within or among the various subgroups, e.g., between thieves and non-thieves during the sign condition, or among non-thieves during the control condition.

For the selection of a non-thief, a randomly selected visitor was observed at all times while on the site to ensure that the individual was not a thief. At the point of exiting the site, the visitor was approached and asked to grant an interview. Thieves were selected for an interview based on the observed performance of a theft. To locate thieves, the interviewer would walk the site posing as a visitor and wait for a theft to occur. Once an observed visitor took wood, the interviewer would exit the site and wait for the thief to

do the same. As the thieves exited the site, they were approached and asked to grant an interview.

Of 54 non-thieves approached, 16 turned down the interview, and seven thieves of the 24 asked to participate declined. The two most common responses given by both groups were time constraints and not being able to speak English well enough to participate. One interviewer conducted all observations of behavior and all interviews. The interviews were conducted on-site with groups or individuals and lasted anywhere from ten minutes to over an hour. We installed a picnic table with a shade cloth covering at the site's parking lot for conducting the interviews. Interviewees were offered something to drink and set at ease by assuring them of complete anonymity and confidentiality of their responses. All thieves were assured that any observed behavior would not be reported to the park rangers.

All interviewees were asked three general sets of questions. (A complete review of the interview process and guide are provided in Appendix A.) The first set of questions was designed to assess how visitors construed the site and to put visitors, especially thieves, at ease with the interview and the interviewer. For example, visitors were asked what they remembered, liked, and thought about the site. The second set of questions was used to determine how our interventions might or might not be working. Visitors were asked what, if any, messages they received about things they could or could not do while in the park, and what they remembered about them. The third set of questions were used to assess visitors' general attitudes, norms, and intentions regarding

petrified wood and petrified wood theft. For example, visitors were asked if they thought stealing wood was wrong, how many others they thought performed the behavior, and if they thought the wood should be protected in a park. Different content areas were probed based on each visitor's particular response. The fourth and last set of questions was only asked of the thieves interviewed. These questions were designed to attempt to understand why visitors were taking the wood, what they may have been thinking at the time of the theft, and how they defined the act to themselves.

Data Analysis

The interviews were tape-recorded with permission and transcribed to allow for analysis. Analysis began with five readings of each interview, during which time topics and themes related to why visitors took wood and how our interventions might be working began to emerge. Once topics and themes were identified, a matrix of those topics that presented potential insights into the two key questions asked by this research was created. This use of a visual device to examine qualitative data is an accepted practice (Glaser & Strauss, 1973; Bogdan & Biklen, 1992). For example, one key question was why visitors steal petrified wood. To examine this issue, any comments made regarding why they took the wood were recorded. Categories were then created based on those responses, and the categories became "headers" for columns in the matrix.

After the creation of the matrix, interviews were reread for a potential response in each category and subsequently coded. Any additional categories or subcategories were

added as needed. Following the coding of all interviews in each category, the matrix was examined for patterns or emerging themes. In the following section, concepts that emerged from the data are discussed and linked, where possible, to existing theory on depreciative behavior.

Results

Table 4.1 gives the total number of interviews conducted under each of the four experimental conditions. Results of the interviews will be discussed in two sections. Themes and concepts that emerged regarding reasons for the actual theft of wood will be discussed first. The second section of results will examine how or why our interventions might have inhibited the performance of that behavior in the eyes of our respondents.

Table 4.1. Total number of interviews conducted during each experimental condition.

Experimental Condition	Thief	Non-thief
Uniformed volunteer	3	9
Pledge	4	9
Sign	4	10
Control	6	10
Total	17	38

Visitor Reported Causes of Depreciative Behavior

One of the most interesting findings that emerged concerned the different definition of the theft behavior by thieves and non-thieves. Two themes help support this finding. One concerned the size of the wood taken, and the second concerned what constituted “stealing” and was therefore wrong. All visitors interviewed acknowledged that taking petrified wood or large pieces of wood was wrong. In fact, it was the most consistent finding produced by the interviews. This might suggest that those visitors that took wood knew that it was wrong. However, the differences found between thieves and non-thieves in the role of the size of the wood in decisions about possible theft and in their definition of stealing, suggest that thieves were defining their particular act of theft in a different manner than did most of the non-thieves interviewed.

When examining the issue of the size of the wood taken, very different results were found between thieves and non-thieves on the concept of whether or not the behavior is wrong. Table 4.2 indicates that all non-thieves, except two, felt that taking a small chip of wood was wrong. However, all thieves, except one, felt that taking a small chip of wood was not wrong. This particular thief was the only one that denied taking a wood chip. When attempting to explain her answer that taking small chips is okay, one thief said, “well, the little chips, like I don’t see the big thing about taking the little chips, so I would say no. But like the big things, I can understand like the big logs. If you’re gonna put it in your trunk, I can understand that.” Another thief, after confronted with the theft, stated, “well, I don’t think it’s like wrong, because, like, it’s a tiny chip, you know.”

One visitor went so far as to say, “I wasn’t taking any, I just took little tiny chips.” Non-thieves, on the other hand, made statements like, “even a little chip. It’s not right,” and “to take one little flake is silly. You should buy what you want at the gift shop.” When asked if it was okay to take a little chip, another non-thief said, “no, I, I mean, where do you draw the line.”

Table 4.2. Visitor responses of whether or not taking a small chip of wood is wrong.

		YES, it’s wrong	NO, it’s not wrong
Uniformed Volunteer	thief	1	1
	non-thief	5	2
Pledge	thief	0	2
	non-thief	7	0
Sign	thief	0	1
	non-thief	10	0
Control	thief	0	5
	non-thief	7	0

Although there was consensus among thieves, except for one, regarding the acceptability of taking small chips, the reasons offered as justification varied. The three most common responses were the prevalence of wood on the site, the sentiment that everyone was doing it, and the belief that the small pieces were not important. For example, one visitor said it was acceptable to take the small chips because, “the big pieces are, like, what they’re really talking about, and (pause) the big pieces are the

important pieces. Cause these little pieces, these little ones, they'd never put together a tree from it." Another freely admitted thief stated that, "the smaller pieces are less important to the integrity of the park than the larger pieces." Another thief stated, "it's just a little piece, it's not like we were coming in with a bag to take out and sell, like, we just wanted one for our pocket."

Another thief after stating that she thought that about 90% of visitors took wood said, "I think that people should be able to take a couple little ones, I don't think there's any great shortage where we were, of the little ones." In fact, 14 of the 17 thieves interviewed stated that they thought most visitors did not follow the rules. Most felt much like one thief when she stated, "I think just about everybody that comes here ends up picking up a piece. If they're anything like me." Another visitor seemed surprised by the question and said, "Who doesn't pick a piece of it up?" Of the 38 non-thieves interviewed, only eight said they thought that most visitors did not follow the rules.

In addition to these reasons that visitors used to explain why the theft was acceptable, they also offered a variety of reasons for the theft. For example, one visitor tried to explain why it was okay for him to do it by stating, "well, it depends on how you define it. I wanted it for a reason," i.e., to take home and show everyone. Another thief said, "I just wanted a little souvenir." One thief tried to explain it this way, "I have a rock polisher and I just wanted to get some little different colored ones. I don't think they're crystals or anything, I just thought they were pretty rocks." In total, four wanted to show the wood to family or friends at home, three simply said they wanted a souvenir, five

offered no reason for why they took the wood, and two thieves stated that they had rock polishers and wanted to make jewelry out of it. The remaining three thieves ended the interview shortly after confronting them with their theft, and so a reason could not be ascertained for the theft. (These three thieves were the only subjects that ended the interview prior to its planned completion.)

The second key difference between thieves and non-thieves that supported the concept that thieves were defining their act of theft as acceptable, emerged from questions asked regarding the gift shop. The idea that thieves wanted a souvenir was followed up by asking them if buying a piece of wood from the gift shop would be the same as the chip they took from the site. Most all agreed that it was not the same. The reasons for this seemed to revolve around the definition of a “real” or genuine piece of wood. One thief, when comparing the wood he could buy in the gift shop to the chip he had taken, summed it up nicely when he said, “they’re not original and mine.”

This idea was followed up by asking visitors whether or not stealing wood from the shelves of the gift shop was the same as taking wood from the site (Table 4.3). Again, an apparent difference emerged between thieves and non-thieves. Although these differences were not as pronounced as the differences between thieves and non-thieves on the issue of the size of the wood, it does contribute to the overall concept or theme that most thieves were not defining their act of theft as wrong. Most non-thieves (i.e., 56%) indicated that stealing wood from the site was the same as stealing wood from the gift shop, and 34% even indicated that it was worse to take it from the site. One non-thief,

when attempting to explain, summed up this line of thought by saying, “yeah, it would be worse because in the gift shop you’re stealing from one individual business person. You’re stealing from the whole world here. It’s just not right.” Another non-thief stated, “I would feel less guilty about stealing from the gift shop.” A majority of non-thieves, however, were not this drastic and made statements like the following visitor when he said, “it would be stealing. The same way, it would be stealing.”

Table 4.3. Visitor responses to whether or not stealing wood from the gift shop is the same as stealing wood from the site.

experimental condition	visitor type	yes, it is the same	no, it is not the same		
			worse to take from the site	worse to take from the gift shop	don't know why it is different
control	thief	1	0	1	1
	non-thief	5	4	0	0
sign	thief	0	0	1	0
	non-thief	4	3	1	0
pledge	thief	1	0	2	0
	non-thief	5	2	0	0
uniformed officer	thief	1	0	1	0
	non-thief	4	2	2	0

When examining the responses from the thieves, a different perspective emerged. In fact, 66% of thieves said it was not the same to take wood from the site as it was from the gift shop and, if pressed, all but one said it was in fact worse to steal from the gift shop. This view was captured by statements like, “It would be worse to steal it in there, I

would think. They put a lot of work into polishing and everything,” and, “I think it would be different because like, those are probably like the polished kind that they, like, have on, like, stands and everything, but like those little chips, like no, I don’t think so.” Many thieves, when confronted with this question, indicated that they had truly not processed their act of taking wood as “stealing” or theft. One couple, after stating that taking little chips from the site was okay, had the following interchange when asked about stealing chips from the gift shop: Male- “hmm, I guess that would be the same. What do you think?” Female- “I don’t know, it’s kind of a tough choice.” Male- “Really, means, I’m crossing myself up saying, well, smaller pieces are less important.” One visitor tried to explain the difference in terms of her mother when she said, “Well, she would understand that I like picked it up from like being in love with the Petrified Forest and like, I took this pebble, mom. But if I took it from the gift shop she’d be dragging me back by my ear to return it.” Two thieves became so uncomfortable with this line of questions that they asked to go on to something else.

Although there were exceptions, generally speaking, it appears as though thieves were defining their act of theft in such a manner as to make the behavior acceptable. In other words, what they did was not as bad as stealing from the gift shop or taking a big piece. These behaviors were more clearly wrong than were the ones the thieves actually performed.

Visitor Responses to Interventions

The second key question addressed by this research was how or why our interventions may work to inhibit the theft of petrified wood from the park. In an attempt to address this issue, subjective responses from the interviews were examined to determine what visitors thought about the interventions, remembered about them, and what they may have said to their group members about them. This may shed some light on what was the most salient about the interventions to the visitor. For example, for interviews conducted during the sign intervention, if most visitors remarked about the fine, perhaps the pre-conventional level of moral reasoning is the best approach to reduce depreciative behavior in the park. To address this issue, interviews were examined according to which intervention was in place at the time of the interview.

The sign

As stated earlier, the sign incorporated several messages with different theoretical groundings. The interviews conducted during the sign intervention indicated that indeed visitors were remembering different elements from the sign. For example, 10 of the 14 visitors interviewed during the sign intervention mentioned what they remembered most about the sign was the foreseeability of the consequences for stealing the wood. Four mentioned the sanctions involved for stealing the wood, and five respondents talked about the mirror. Three mentioned ethics and future generations, and four simply stated that what they remembered was that you shouldn't take petrified wood. Only one visitor,

a thief, said she did not see the sign. In addition, the same visitor often remembered several different things from the sign. One visitor when asked about the sign said, “it said that you could be put in prison.” When asked what else she remembered about the sign she said, “it said 99% of the people were not thieves, but 1% was, were, and that in 15 years all the rocks would be gone, all the rocks would be gone.” The same visitor then went on to remark about the mirror on the sign. There also appears to be no difference in the variation of those responses between thieves and non-thieves. In fact, the only element of the sign that was not mentioned by thieves, and that was mentioned by non-thieves, was the fine for taking the wood.

The interpretation of what those remembered things mean in terms of the relevant theory at work is also not clear. For example, five respondents interviewed during the sign intervention remembered the message from the sign that most people do not steal wood, but that the damage from those few that do take the wood is great. One visitor said, “we were very impressed by the sign that we saw that said 99% of the people do not, but the 1% can devastate it over a period of time.” Another respondent stated that, “it talks about what things will be like in a few years if only 1% of the population are thieves. Umm, it would soon disappear because of the millions of people that are here every year.” These statements could easily be interpreted as an indicator that norm theory was being applied by visitors. However, attitude researchers could interpret the statements as an indication of the processing of the foreseeability of the consequences of a behavior and the subsequent applicability of the attitude regarding performing the

behavior. Regardless of the theory used to explain this result, it seems clear that many visitors exposed to the sign remembered and mentioned the consequences of stealing a chip of wood.

Assuming the statements above indicate visitors' acknowledgment of the foreseeability of consequences, then those visitors that mentioned the photographs also acknowledged the foreseeability of consequences. Taken together, seven of the ten non-thieves and three of the four thieves interviewed during the sign intervention, mentioned the foreseeability of consequences of taking petrified wood. For example, one visitor stated, "what stands out is the vandalism. The picture at the front which shows how it was in '65 and now in '95 there's hardly anything and-it says in 15 years if 1% of the visitors take things, there won't be anything left in 15 years." Another visitor also typifies this type of response with the statement, "the graphic here of, of the past, the present, and perhaps the future if something is not done, I thought that was very effective." These visitors clearly understood what would happen if even a small percentage of visitors take wood. That is not to say that this knowledge necessarily affected behavior for every visitor, as one thief remarked, "I think the two photos from 1965 and 1995 are very impressive and so I think if everybody takes one chip, umm, if one person takes, I think every chip is so important as, umm, the big ones." This remark was made after the visitor admitted the theft. Regardless, it appears as though the foreseeability of the consequences was a primary message received by those interviewed.

Taken together, visitors seemed to be retaining many different elements from the sign intervention. The results suggest that the intervention may have been working due to the conveyance of the consequences of the behavior, visitors' responsibility for those consequences, and/or the possibility of a sanction or fine for taking the wood.

The Pledge

All respondents acknowledged signing the pledge and, as with the sign, responses to the pledge were also varied. Three respondents remarked that they thought the pledge was a good idea because there would be less theft. Two respondents talked about the negative consequences if everyone took wood and so they thought the pledge was a good idea to make people think about that. Six simply said that they had to sign a pledge when they came in, and four mentioned the pressure to keep their word.

One visitor stated, "after signing it I thought, oh, I can't scratch my name out now, I guess I can't take any." Another thief admitted that she knew she was going to take some wood when she entered the park and so she hesitated to sign the pledge, "I knew I was lying." Although this may indicate the underlying theory of consistency and commitment, later in the same interview the following comment made about the pledge was more in line with pre-conventional moral reasoning theories: "we shouldn't have signed it because that's something that could be used against you in court if, you know, if they would have tried to take you to court." Another visitor appeared to have processed the foreseeability of the consequences for taking wood from the pledge. When asked why

he thought people were asked to sign the pledge he said, “well, why is because that you can see right here at this site, right here that everybody picked up all the crystals. They don’t leave anything for me to see.” Just as with the sign intervention, the way in which visitors internalized or thought about the pledge intervention was varied and not necessarily in line with one particular theory.

Uniformed Volunteer

All respondents, except one thief and one non-thief, said they saw the uniformed volunteer on site. As with the other two interventions subjective responses to the uniformed volunteer intervention could also be linked to several of the underlying theories of behavior influence. Six respondents simply said they saw her and figured she was here to stop theft. Three mentioned the negative consequences for stealing wood, one mentioned the need to protect it for future generations, and one mentioned the fine for taking wood.

On the surface most responses seem to converge on the perception that the uniformed officer was here to stop theft. Comments like, “it’s good also to see a ranger here that is keeping an eye on things,” were very common. This may indicate the priming of an attitude or norm regarding theft behavior. In addition, the same visitor went on to state, “ because, you know, like, if everybody took just one little bit-it’s gone forever.” This statement is reflective of the conveyance of the foreseeability of the consequences of the behavior and thus the applicability of the primed attitude or norm regarding theft.

The same individual then made the statement that, “I saw her there, and I knew what she was doing, but you know, I’m not gonna pick anything up because (chuckles) the fines are too big.” From this one interview, it is not clear if the presence of the uniformed volunteer primed the attitude that stealing was bad, reminded the visitor of the norm for behavior, or made salient the consequences for performing that behavior. It also suggests that not only do differences exist between respondents in how they process an intervention, but also within one visitor different schemas can be activated by one intervention.

Conclusion

In conclusion, subjective responses from visitors can give some contextual understanding into the scenario provided at the beginning of this paper. When examining the issue of why visitors stole wood, it appears as though the three broad perspectives discussed in the literature review, coupled with theories from social-psychology, psychology, and sociology, can aid in interpreting and understanding the depreciative behavior of wood theft.

Using Gramann and Vander Stoep’s (1987) taxonomy, most thieves appear to fall in the “responsibility-denial” category of violators. Statements made by thieves indicate that they were aware that taking petrified wood was generally wrong. However, they seemed to be invoking “not in this case” rationalization for why it was okay in their particular circumstance to take the chip. The most common response was that it was

okay because it was such a small chip. We also found that some violators may not have been applying the norm regarding theft to the chips of wood on the site. This could have been because they did not understand or accept the responsibility for the consequences for the behavior (i.e., uniformed and responsibility-denial violators, respectively). In addition, using attitude theories to interpret the same result, visitors may not have seen the applicability of their attitude regarding theft, to taking chips of wood from the site.

Hardin's (1968) approach to understanding depreciative behavior can also shed some light on the depreciative behavior of stealing wood. Of all of the thieves interviewed, only one said he was sorry for taking the wood and none of them returned the wood to the site. In fact, several asked if they could keep it. One visitor, after remarking about the devastating results if only a few people took wood, and apologizing for taking his chip, still asked if he could keep it. This could be supporting evidence for the tragedy of the commons perspective on depreciative behavior. Despite some thieves' acknowledgment of the negative consequences for the behavior, they still wanted the chip. Their personal benefit of getting a chip of wood was still greater than the cost which was shared by everyone. This result could be used to explain why some have concluded that depreciative behavior may never be reduced to zero (Vande Kamp et al., 1995).

Using theories of behavior change and influence combined with results of existing depreciative behavior studies, we can also examine the subjective responses from visitors to determine how our interventions may be working to inhibit the theft of petrified wood.

Although some visitors still took wood even when our interventions were in place, we did significantly reduce the theft level with all three of our interventions (Roggenbuck, Widner & Stratton, 1998; See article 1 for a full review). The most generalizable conclusion that can be made from those interviewed is that visitors were apparently responding to and processing the interventions in a variety of ways that resulted in decreased depreciative behavior. For example, subjective responses suggest that exposure to the interventions may have influenced some visitors due to the conveyance of the norm or making applicable their attitude regarding theft. Other visitors, however, appeared to be responding to the conveyance of or the increased salience of the negative consequences of the behavior. The threat of a sanction was the main message processed by some visitors, while other responses indicated that visitors may have been acting out of a sense of moral responsibility to protect the resource for future generations or to keep their word.

Considering the responses for why visitors took wood coupled with the subjective responses to our interventions, we can make several insights that should help alleviate the noncompliant behavior of petrified wood theft. First, visitors must be made aware of the norm or rule for behavior and its applicability to their situation. Secondly, they must understand the negative consequences for the performance of that behavior. Methods of doing this could include conveying the negative consequences to the visitor of performing the behavior, and conveying the negative consequences to the environment of the

behavior. Incorporation of both appeals should serve to reach more visitors than either approach used alone.

The fact is, as long as visitors can rationalize their own depreciative behaviors as acceptable, we may not be able to reach every visitor every time. However, with a richer understanding of why such behaviors occur and how interventions may work to inhibit the behaviors, we may be able to reach most of the people, most of the time. This research is one step on a long path in that direction.

CHAPTER V: SUMMARY

There are three primary findings of this study. The first major finding of this research was that all three of the designed interventions significantly reduced the theft of petrified wood. Using deduction from the interviews, it became clear that the theories of behavior change used to create the interventions were practically working in ways suggested by the theories. In addition, the primary directive behind the creation of the interventions was that behavior change strategies do not have a blanket effectiveness for all individuals. Therefore, interventions, like the sign, incorporated multiple messages theoretically grounded in a range of behavior change strategies. Interviews revealed that visitors were processing and responding to a myriad of behavior influence techniques from a single intervention. In fact, even for the intervention of the uniformed volunteer, which on the surface may intuitively seem to be effective because of the single element of a threat of or increased probability of getting caught and fined, the interviews revealed that the effectiveness appeared also due to several other reasons. For example, for some visitors the uniformed volunteer made more salient the norm for behavior, but for others it appeared to promote the conveyance of the foreseeability of the consequences for stealing wood.

Collectively, subjective responses suggested that exposure to the interventions may have influenced some visitors due to the conveyance of the norm or making more applicable their attitude regarding theft. Other visitors appeared to be responding to the

conveyance of or the increased salience of the negative consequences for the behavior.

The threat of a sanction was the main message processed by some, while other responses indicated that visitors may have been acting out of a sense of moral responsibility to protect the resource for future generations or to keep their word. These responses coupled with the statistical reduction in the theft rate suggests that our interventions were working in accordance with the theories used to create them.

The second primary finding of this study is provided by the insights into why visitors took the wood. These responses indicated that our attempts to control behavior were relevant to the decision-making process regarding wood theft, just not effective in all cases. For example, most thieves indicated that taking one little chip could not hurt anything. Therefore, our message that attempted to convey the negative consequences for taking a chip was appropriate but not processed or accepted by all visitors. Many thieves rationalized that “in their case” it would not hurt anything to take a little chip. All visitors interviewed acknowledged that they knew that taking petrified wood was wrong. Most thieves, however, only applied this rule or norm to the larger pieces of wood. In addition, attitudes or norms regarding stealing seemed to also be selectively applied by thieves. For example, for most thieves, stealing wood from the gift shop was more clearly wrong than taking wood from the site.

Lastly, the combination of qualitative and quantitative methods of data collection and analysis can provide a contextual understanding of depreciative behavior, in this case the theft of petrified wood from the Petrified Forest National Park. Using any one of the

methods alone would not have provided the rich understanding of the phenomenon of wood theft and of attempts to stop the performance of that behavior. This study demonstrates the benefits of discovering not only the numbers, i.e., the number of thieves under various behavior change interventions, but what the numbers mean in the context of the situation. Approaching complicated social science research and management questions in this manner, we can begin to more effectively know and therefore manage visitors.

In summary, this study provided some contextual understanding into the demonstrated statistical success of interventions designed to reduce the theft of petrified wood. This study represents an important step along the path to not just controlling depreciative behavior in natural resource areas, but also to understanding it.

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Appendix A.- Semi-structured interview guide

Interview Guide

-test the tape

-prep it (date, time, subject's ID number)

Informant # _____ **Date** _____ **Time** _____

Greeting:

Hi, my name is Carolyn Widner. I am a PhD student at Virginia Polytechnic Institute and State University. I am conducting a research project here in the Petrified Forest National Park to examine the issue of petrified wood management. I hope to collect data from which I can do my dissertation. I want to learn more about how you, a visitor, feels about the removal of petrified wood from the park and what can be done to stop it. I am here to talk to selected visitors to try to assess their attitudes, preferences and opinions about this park and the potential problem of protecting petrified wood.

You have been selected to participate in the study. As a visitor to the park I consider you an expert, and want to obtain information about how to better protect the resources here in the park. Your participation is completely voluntary and would be greatly appreciated. Before you decide, let me tell you exactly what your participation involves.

There are a couple tables over here where we can sit down and be more

comfortable. There are some sodas and some juice in the cooler if anyone in your group or you would like to have one.

The purpose of this investigation is to gain a more in-depth personal level of knowledge about the situation here in the park. Because of this, I am using interviews to gain a clearer picture. The interview should take about a half hour. Any information you provide will be kept confidential and completely anonymous. No one except myself will know who you are, and I do not need your name. Nothing you say will be associated with your name in any way.

Your participation is completely voluntary and you may stop the interview any time during the process. I will be using a tape recorder to assure accurate recording of information during interviews. But, I promise that the tapes will be destroyed within 3 months, once their contents have been summarized by myself and my research team.

If you have any questions regarding this research or the results from it, here is a self-addressed, stamped post card that you can send to me to request this information. I will not be returning home to Virginia until mid-August, so it may be a while before I can respond to you.

Now that you have some background about this study, do you think you would be able to help us by granting me an interview?

I appreciate your interest in helping with this study. I want to interview one selected visitor at a time, and would only ask that the others in your group give us some privacy for the interview.

Before we continue, if it is OK with you, I would like to turn on the tape recorder now. (Turn on the tape). tape **YES/NO**

Consent Form:

Before we begin, I need to read some things to you to make sure you are fully informed about what we will be doing.

As I said, I am studying the issue of petrified wood protection and how we can better protect the resources in the park. Here is a letter you can take with you that provides some information about the research project, my name and address and the same for my immediate supervisor and department head at Virginia Tech. If you have questions or concerns, feel free to contact any of us.

Now, before we can start the interview, my university requires that you sign a form acknowledging your willingness to participate. (Give them a copy) It states that...(summarize consent form and have respondent sign it and insert in a box that I am blind to). (The consent form has the disclaimer etc. and although I stated it earlier, this puts the consent on tape).

I will be using the following interview guide to conduct this interview. (Show it to them).

Section #1-Constual of the site

(This first general set of questions is designed to do two main things. 1-Describe the visitors' experience at the site and their salient perceptions about the site, and 2-to assess their primed perceptions of others removing wood, of their own thoughts regarding themselves removing wood and of the amount of wood on site.)

1. How many people are in your group? _____

Here is a map of the park, could you mark with an X all of the places you have stopped since you have been here today.

2. How would you compare this site to others you have visited today? _____

3. What stands out the most in your mind about this site? (probe to find out what things stood out) _____

Here is a map of this particular site. Could you show me all of the places you visited on this site. (The map is a prop to get them to tell me the story of their visit to Crystal Forest-where stopped, what they did, talked about, thought about, etc.). For the various sections of the trail they covered, and spots they stopped, ask them:

What were you doing in this section of your walk? _____

What did you see? _____

About how much time did you spend in this area? _____

About how many people do you remember seeing (if any) in each area? _____

4. Did you intend on getting a piece of petrified wood to bring back with you from the park?

YES/NO

How did you think you would get it? _____

Buy it or pick it up? _____

5. What do you think about the amount of wood out here? _____

Did you pick up any wood to look at it closer, or just to feel it ? **YES/NO**

(NT) As you walked around out here and saw all this wood, did you think about taking a piece? **YES/NO**

What did you think about it? _____

Easy or Difficult? Wrong or Probably OK?

6. As you walked around the park today, did you notice anyone taking any petrified wood? **YES/NO** If no-stop. If yes: How many people? _____ Without giving me any names, what was their relationship to you; family, friends or strangers? What did you think about it? _____

Did you discuss it with others in your group? **YES/NO**

What was said? _____

Section #2-Primes

(This second general set of questions is designed to do two main things. 1- To get the visitors to reconstruct their experiences with the various anti-theft primes used throughout the park, including ours, and 2- To assess the extent to which the visitors cognitively processed the primes, and if, and how, the primes might have affected them.)

1. Since you have been here in the park today, what information have you received about the things you can do or not do in the park? _____

2. When you entered the park today, you probably had some idea of what you might do while you were here and how much time you would probably spend here, etc. Was the information you received today useful to you during your visit to the park? **YES/NO**

How so? _____

What do you believe is the most useful thing you learned? _____

3. Since you have been in the park today, have you noticed or received any information regarding petrified wood protection? **YES/NO**

4. About how many different sources of information can you remember encountering?

5. What is one specific message or source of information that really stands out in your mind? _____

Where did you encounter it? (If not already discussed) _____

What did it say? _____

-How did you receive the message?-(if not already discussed i.e., personal contact-sign-brochure,etc. _____

-About how much time did you spend there? _____

-Did you discuss the information with others in your group? **YES/NO** What was said? _____

(What is another message you can specifically remember...repeat above process)

5b. What is another specific message or source of information that really stands out in your mind? _____

Where did you encounter it? (If not already discussed) _____

-What did it say? _____

Where did you receive the message?-(if not already discussed i.e., personal contact-sign-brochure,etc. _____

-About how much time did you spend there? _____

-Did you discuss the information with others in your group? **YES/NO** What was said? _____

5c. What is another specific message or source of information that really stands out in your mind? _____

Where did you encounter it? (If not already discussed) _____

-What did it say? _____

-How did you receive the message?-(if not already discussed i.e., personal contact-sign-brochure,etc. _____

-About how much time did you spend there? _____

-Did you discuss the information with others in your group? **YES/NO** What was said? _____

5d. What is another specific message or source of information that really stands out in your mind? _____

-Where did you encounter it? (If not already discussed) _____

-What did it say? _____

-How did you receive the message?-(if not already discussed i.e., personal contact-sign-brochure,etc. _____

-About how much time did you spend there? _____

-Did you discuss the information with others in your group? **YES/NO** What was said? _____

6. Of all of the messages and sources of information that you have encountered today about petrified wood protection, was there one that you particularly liked the best?

YES/NO

Which one? _____

Why? _____

7. Considering all of the information that you have received today, do you think there is one central message? **YES/NO**

What is it? _____

Sign:

1. Did you see any anti-theft signs while here at Crystal Forest? **YES/NO**

2. Did you read it? **YES/NO**

3. What did it say? _____

4. About how long did you spend at the sign? _____

5. Did you discuss anything about the sign with others in your group? **YES/NO** What was said? _____

6. What do you remember most about the sign? _____

Uniformed employee:

1. Did you see any park employees while here at this site today? **YES/NO**

2. After you noticed her, did you think anymore about her presence? _____

3. Did you discuss or point out her presence to others in your group? **YES/NO** What did you say? _____

Why? _____

4. Why do you think she is out here? _____

5. Did you talk to her? **YES/NO** What about? _____

Commitment:

1. Were you asked to sign a petition when you entered the park today? **YES/NO**

2. Did you sign it? **YES/NO**

3. What was the petition about? _____

4. What did it say? _____

5. After you signed the petition and entered the park, did you discuss the petition with anyone in your group? **YES/NO**

6. What did you talk about, or say about it? _____

7. After you signed the petition, did you think any more about it until I just asked you?

YES/NO

What did you think about it? _____

Section #3-Attitudes, norms and intentions

(This third set of questions is designed to assess the visitor's general attitudes, norms and intentions regarding petrified wood theft.)

1. Do you believe petrified wood should be protected in a park such as this one?

YES/NO

Why or why not? _____

2. Do you believe petrified wood is rare or common? Why? _____

3. Do you believe petrified wood is beautiful or did you think it was pretty plain looking? _____

4. If you wanted to take a piece, do you think it would pretty easy to do it?

_____ Why? _____

5. Do you believe taking one piece of wood would be wrong? **YES/NO** How about a very small piece like a flake? **YES/NO**

6. Do you believe removing a piece of petrified wood from, let's say, the shelves of the visitor center is the same as picking up a piece from the ground? **YES/NO**

Why or why not? _____

7. As you walked around out here and saw all of the little wood chips, do you think the anti-theft messages really included all of the little chips?

YES/NO _____

8. Now I want you to think about the important people in your life. What do you believe most of them would think about you removing a piece of petrified wood from the park?

_____ Who are these important other people? _____

9. As you walked around the park today and were faced with the opportunity to take wood, did you think about what others would think if you took the wood? **YES/NO**

What did you think? _____

10. How important is it to you to do what these others think you should? _____

11. When you entered the park today what, if any, did you consider to be the rules for behavior about petrified wood? _____

Do you believe that most visitors follow these rules? **YES/NO**

12. As you walked around the park today, did you think about these rules? **YES/NO**

What did you think about them? _____

NON-THIEF STOP. I would like to thank you very much for your cooperation and your time in helping with this research project. Again, if you have any questions or comments about this research, please feel free to contact me or any of my supervisors.

Section #4-Behavior:

I do not mean to embarrass you or to put you on the spot, but you are in a unique position to be able to give us some great insight into this issue of wood theft. Before I continue, I want you to remember this is all completely anonymous. I noticed you picked up some petrified wood and may have it with you. No one besides myself knows that you have

picked up a piece of wood. I do not want it back and I will not tell anyone. I told you this because you are in a unique position to help us. I need to know from visitors such as yourself, what the park could do differently, if anything, to prevent wood theft. Your information could be used to help better protect the resource in the future.

1. What were you thinking about as you took the wood? _____

2. Did you think it was wrong as you were doing it? **YES/NO**

3. What were your concerns, if any, as you took the wood? _____

(probe to find out what these concerns were)

4. Did anyone else in your group know that you took a wood chip? **YES/NO**

What, if anything, was said? _____

5. Were you alone or with your group when you picked up the wood?

6. If appropriate(see question 6 in first section)-Did you take the wood before or after you saw others take wood? **BEFORE/AFTER**

I would like to thank you very much for your cooperation and your time in helping with this research project. Again, if you have any questions or comments about this research, please feel free to contact me or any of my supervisors.

Debriefing

Comments and observations: _____

Vita

Carolyn June Widner was born June 13, 1967 in the Blue Ridge Mountains of southwest Virginia in the town of Wytheville. She graduated from George Wythe High School in Wythe County in 1984, attended Wytheville Community College and graduated Magna Cum Laude from Emory and Henry College in Emory, Virginia in 1990 with a Bachelor of Arts degree in Geography. She received her Master of Philosophy degree in Forestry from Virginia Tech in 1993. She recently completed her Ph. D. Degree in Forestry from Virginia Tech in July, 1998, specializing in outdoor recreation and interpretation.

Carolyn worked as a park interpreter at Hungry Mother State Park in Marion, Virginia, a consultant for Mount Rogers National Recreation, an elderhostel instructor, and as a graduate research and teaching assistant at Virginia Tech. She has been employed by Humboldt State University since August, 1996, and is currently an Assistant Professor teaching interpretation, public relations, and human dimensions of natural resource management.

She is owner and friend to one horse, Misty and two dogs, Lady and Number One. She currently lives in the Redwoods on California's north coast. Her heart still resides in the Blue Ridge Mountains of her home.

A handwritten signature in black ink, appearing to read 'Carolyn J. Widner', with a long, sweeping flourish extending to the right.