UNDERSTANDING PETRIFIED WOOD THEFT FROM A MORAL REASONING PERSPECTIVE

by

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

MASTER OF SCIENCE in Forestry

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March 1995 Blacksburg, Virginia
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(ABSTRACT)

The purpose of this study was to estimate the extent of petrified wood theft at two popular petrified wood sites at Petrified Forest National Park and to describe the nature of the thieves in terms of their level of moral reasoning. A model of noncompliant behavior was developed that incorporated the theory of reasoned action, the theory of planned behavior, the theory of attitude accessibility, and the four-compartment model of morality. The model proved valuable in understanding petrified wood theft.

Data were collected by non-obtrusive observations, brief on-site interviews, and an eleven-page mailback questionnaire. In total, 226 park visitors (125 thieves and 101 non-thieves) were observed. Of these, 145 (77 thieves and 68 non-thieves) agreed to be interviewed and were given a questionnaire. Altogether, 116 (61 thieves and 55 non-thieves) returned a completed questionnaire for a combined response rate of 80.9 percent. A total of 456 park visitors, who were not observed, were also contacted and given a mailback questionnaire. Of these, 365 returned a completed questionnaire for a 80.0 percent response rate.
An average of 1.02 thefts were observed per hour of observation at the two petrified wood sites. And, 1.22 percent of visitors at the two petrified wood sites collected at least one piece of petrified wood. An average of 1.6 pieces of petrified wood were taken per theft. These findings emphasize the seriousness of petrified wood theft by park visitors.

Thieves were found to be significantly more thoughtless than non-thieves as measured by an impulsiveness scale. Also, thieves scored significantly higher than non-thieves on the preconventional level of moral reasoning scale. The findings imply that intervention programs which access desired attitudes toward petrified wood and establish a credible threat of punishment will be the most effective in reducing petrified wood theft.
"Whatever wisdom may be,
it is far off and most profound --
who can discover it?"

-- Ecclesiastes 7:24 (NIV 1978)
ACKNOWLEDGMENTS

This study was made possible by funding from the Western Regional Office of the National Park Service, San Francisco, California.

I would like to thank my committee chair, Dr. Joe Roggenbuck, for his thoughtful critiques of this document as it was being developed. I would also like to thank my other committee members for their valuable contributions. Dr. Jeff Marion assisted during the OMB approval process of the questionnaire and helped me maintain a "connection" to the management implications of this project. Dr. Bruce Hull was always there to question my reasoning, which compelled me to become more "connected" with the theoretical underpinnings of my thesis.

I am indebted to several individuals for their considerable advice and assistance during the developmental stages of my thesis. I am especially indebted to Dr. Dan Williams, Dr. Mike Patterson, and Bill Borrie who freely offered their talents whenever I was in need.

I am very grateful for the loving support of my parents, Dale and Kathleen Stratton. I especially would like to thank my dad for spending time with me traveling to exciting places of my choosing when I was growing up. It may have been our travels to the southwestern United States in 1981 that sparked my interest in this project, since we visited Petrified Forest National Park and confronted the moral dilemma of petrified wood theft first hand.

Finally, my very deepest heartfelt thanks goes to Sue, Ben, and Jay for their continuous support throughout this project.
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CHAPTER ONE: INTRODUCTION

Description of Study Location

The landscape of northeast Arizona over which the artificial boundaries of Petrified Forest National Park (PFNP) lie, holds a wealth of information about the history of the earth. This particular corner of the world testifies to the dynamic nature of our planet and its people. In geological terms, the land in and around the park holds rich records recounting the earth's history some 230 million years ago. This point in time falls into what geologists refer to as the Triassic period (225 to 260 million years ago). Some paleozoologists and paleobotanists consider the Triassic period to be the time when all modern ecosystems known today were being established (USDI 1993).

The park has global significance in its illustration of life in the Triassic period. It holds vivid records of a tropical wet ecosystem that dominated this area of the world. Clues to past plant and animal life are abundant in the park, but the petrified wood of ancient trees dominant the surface landscape in several locations (Dedera 1983). Also recorded by the landscape are the histories of several human cultures, some dating back 10.000 years. Ruins from meeting and dwelling places.
chipped stone artifacts, rock art, shards of pottery and other cultural artifacts attest to the fact that Native Americans visited and inhabited this area in times past (USDI 1993).

With the westward movement of Euro-Americans in the mid-1800's, the concentrations of petrified wood became known to the American public. When the Atlantic and Pacific Railroad was completed in 1883 just north of the "petrified forest", the area became a travel destination for more and more people. Some of these early visitors were content in looking upon this wonder of nature, while others saw the possibility of economic gain from extracting minerals contained in the petrified wood. This led to the establishment of the town of Adamana on the rail line with its mill to crush petrified wood into abrasives. People often used dynamite to break apart large petrified wood logs in search of the crystals they contained. With the wholesale destruction of the petrified forest, John Muir and others pressed for federal protection of the area (Ash and May 1969).

President Theodore Roosevelt responded to the pressure by issuing a proclamation under the Antiquities Act of 1906 (P.L. 34-225) that established Petrified Forest National Monument on December 8, 1906. The proclamation stated the purpose for establishing the monument was to promote the public good by reserving the deposits of fossilized wood for their scientific interest and value (P.L. 34-3266). This marked the beginning of the protected area that would become part of PFNP on March 28, 1958 (P.L. 72-69). With the creation of the National Park Service in 1916 came the mandate 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). Under this mandate, the Park Service was and still is required to perform a balancing act by determining how to conserve the natural features of the parks in the face of public enjoyment. The challenge of this mandate is especially relevant at PFNP, where over 800,000 people visit the park annually, coming from across the United States and around the world (USDI 1993).

While the park contains some 93,533 acres, most of the park visitors are concentrated along a narrow north/south corridor that follows the 27 mile park road (See Figure 1). All of the park's main features are located along this road or within a short distance of it. The north end of the road provides direct access to Interstate Highway 40 and the south end to U.S. Highway 180. These access points provide the only two entrance/exit points that are to be used by park visitors. The typical visitor spends only a short time in the park, usually less than three hours. For most visitors, PFNP is not a primary destination, and for some it becomes part of their travels only after seeing a sign along the highway that mentions the park. There are no overnight accommodations in the park. The only visitors allowed to remain in the park overnight are the few backpackers who stay in the park's backcountry or two wilderness areas.
FIGURE 1: Petrified Forest National Park Map (from USDI, National Park Service 1992)
Petrified Wood Theft

The mandate that directs park managers to protect the petrified wood resource for the enjoyment of present and future generations is challenged by park visitors who remove petrified wood from the park. Visitors typically remove only a small amount for their personal use and not for profit. This particular type of visitor behavior is identified by the park's General Management Plan (USDI 1993) as the park's number one resource protection problem. It is not the commercial collectors that have park officials so concerned, but the common visitor who for whatever reason takes a small amount of petrified wood from the park. Over the years, park managers have tried a number of methods to deter the theft of petrified wood by park visitors, however the amount of theft has always remained at unacceptably high levels.\(^1\)

Current park intervention programs include several anti-theft messages that visitors may encounter during their visit to the park. Park rangers at the two entrance stations inform each group of visitors entering the park that it is illegal to do any type of collecting in a national park. And, all groups are also asked by the ranger if they have any petrified wood, plants, rocks, etc. that they are bringing into the park. If so, these items are tagged to protect the visitors from being wrongly accused of taking something they brought into the park. Entrance station staff also have the ability to inform visitors of the park's policies in several languages through the use of written media. Therefore, all park visitors, with few exceptions, should be aware that it is illegal to remove petrified wood from the park.

\(^1\)See Bowman 1990 for a review.
Along the park road and at some of the petrified wood sites, visitors are reminded that removing petrified wood is prohibited. Visitors approaching the park exit points are informed that there is a vehicle inspection station ahead. At the "inspection" station (the outbound side of the entrance station), visitors are asked by a ranger if they have done any collecting while in the park. The typical response by visitors is some form of "no". By responding with a "no", visitors can proceed out of the park without any further inspection, other than maybe the silent voice of their own conscience if they did not tell the truth. If visitors respond with an affirmative answer, they are asked to pull over and wait for a law enforcement ranger to "inspect" what they collected.

The Painted Desert Visitor Center at the north end of the park and the Rainbow Forest Museum at the south end of the park both contain signs and displays that inform visitors that removing petrified wood from the park is illegal. The Painted Desert Visitor Center also has a video that contains an anti-theft message. Anti-theft messages at the visitor center and the museum inform visitors of the monetary costs (i.e. fines) they will incur if caught removing petrified wood from the park, the cost to future generations, and the cost to their conscience. One exhibit displays letters from park visitors who have returned petrified wood they removed from the park. The letters often tell of how the person's conscience became an unbearable burden in their lives or the run of "bad luck" they attribute to taking petrified wood from the park.
Law enforcement and interpretive rangers frequent the petrified wood sites to patrol and/or to provide visitors with information about the park. Also, to possibly ease the desire of some to take petrified wood from the park, the park's two gift shops sell petrified wood, obtained from private lands outside the park.

**Problem Statement**

With all of these anti-theft messages, one might believe that the theft of petrified wood would be limited to a very few individuals with criminal intentions. However, park managers do not believe this to be the case. Park officials feel that a typical thief can not be described demographically, nor can the context in which the theft occurs be described and understood adequately. For example, law enforcement rangers feel that they have caught just about every type of visitor taking petrified wood from the park. Also, the context of the thefts vary. Some occur by the trails in front of other visitors, while other thieves try to be much more discrete about their behavior.\(^2\) Many questions need to be answered. While some of the intervention programs may be effective in reducing the level of petrified wood theft, there is no empirical evidence on the effectiveness of any individual program, let alone the park's overall intervention program. In the park, there are about as many different "theories" on how to best limit the theft of petrified wood as there are park staff members.

Lacking a systematic study of the amount and nature of petrified wood theft and the characteristics of the visitors who take petrified

wood, park managers have relied on their intuitive assessment of the situation in designing intervention programs. Current intervention programs have failed to satisfy park management objectives. An estimated twelve tons of petrified wood are removed from the park each year (USDI 1993). Park managers are struggling with their dual mandate of conserving the park's petrified wood resource for future generations while allowing the current generation to enjoy the park. The question park managers are asking is what types of intervention programs will be most appropriate and effective to protect both the resource and the freedom of park visitors.

Research Objectives

To design, test, and implement an effective intervention program, it is necessary that such a program be founded on theories of recreation behavior, human behavior, and behavior change. This will require information on the extent and nature of petrified wood theft and the characteristics of thieves. The goal of this investigation is to begin to provide such information by focusing on the role of moral reasoning in decisions to take petrified wood. Specifically, the objectives of this investigation are to estimate the extent of petrified wood theft at two popular petrified wood sites and describe the nature of the thieves as it relates to their level of moral reasoning.

It should be noted that this investigation is only a portion of the first phase of a proposed four phase study. In addition to moral reasoning, the first phase conducted during the summer of 1993 examined petrified wood theft from demographic, attitudinal, motivational, and
normative perspectives. The second phase conducted during the summers of 1993 and 1994 was concerned with physically measuring the change in amount of petrified wood in sample plots over a year (Monkevich 1994). The proposed third phase objectives (scheduled for implementation during the summer of 1995) are to design a variety of anti-theft messages and practices based on the findings of the first phase that specifically target visitor groups failing to respond to current efforts. The proposed fourth phase objectives are to develop and test a comprehensive system of messages and practices designed to curb petrified wood theft based on the findings of the previous three phases.
CHAPTER TWO: LITERATURE REVIEW AND HYPOTHESES

Noncompliant Behavior in Recreational Settings

The action of a park visitor collecting a small amount of petrified wood from PFNP would be described as a minor act of noncompliance by Vande Kamp et al. (1994). This type of behavior is not a unique problem for park managers. In a survey of national park superintendents, 72% of the survey participants reported noncompliance by park visitors caused nonrepairable damage to park resources (Johnson et al. 1994). This type of nonrepairable damage is often to archeological, paleontological, and historical sites. When asked to rank what they considered to be the most destructive noncompliant visitor behaviors in their parks, managers ranked damaging, defacing, or collecting paleontological, cultural, or historical objects as the second most damaging behavior for frontcountry sites and the most

3Noncompliant visitor behavior is defined by Johnson et al. 1994 and Vande Kamp et al. 1994 as "minor rule-breaking behavior or failures to comply with minimum impact regulations (e.g., off-trail hiking, souvenir collecting, feeding wild animals, littering). This definition excludes major acts of vandalism and acts motivated by obvious criminal intent."
damaging behavior for backcountry sites. The behavior of collecting 
petrified wood is among these highly ranked problems.

With park managers ranking these types of noncompliant visitor 
behaviors as some of the most serious problems they face in protecting a 
park's resources, one might expect a large amount of research to address 
these issues. However, most of the existing research has focused on 
noncompliant behavior as it relates to off-trail hiking (Johnson and 
(Clark et al. 1971, Oliver et al. 1985 and Dywer et al. 1989), and 
damage to historical sites and artifacts (Gramann and Vander Stoep 
Helens National Volcanic Monument is the only study found to be directly 
alogous to illegal collecting behavior in national parks. The study 
found that 12.3% of all visitors to a short loop trail were observed to 
remove at least one piece of pumice from the site with no intervention 
program in place. Four intervention programs were tested: three types 
of trailhead signs and a brochure. All proved effective in reducing the 
collecting behavior. The first sign reduced the percentage of people 
taking pumice to 3.3% by simply asking visitors not to remove ash or 
pumice. The second sign reduced the percentage of people taking pumice 
to 3.9% by requesting visitors to report violators who were seen 
removing ash or pumice. The third sign reduced the percentage of people 
taking pumice to 0.9% by informing visitors that they would be 
prosecuted for removing ash or pumice. The interpretive brochure 
reduced the percentage of people taking pumice to 3.8% by requesting 
visitors to follow the rules. The study's research design however could
not provide information on how effective the intervention was across time or the effect of the intervention upon behavior after a visitor left the site. Little was learned from the study of the characteristics of the thieves or the context in which the theft took place.

Theories of Recreation Behavior

Given the desire of park managers at PFNP to reduce the theft of petrified wood emphasizing lighthanded management techniques\(^4\), it is helpful to look at what theories may be applied to predict or explain the problem behavior. Theories of recreation behavior, human behavior, and behavior change can serve as a starting point in understanding how to approach this problem. Understanding behavior in recreation or leisure settings is important since it is the primary context in which the behavior is taking place. These theories are useful in understanding why people visit national parks and how they interact with their environment in a leisure context. Human behavior theories can be used to better understand the reasons why people do what they do. And behavior change theories can be applied to mitigate problem behaviors using a range of approaches.

\(^4\)Visitor education and subtle site manipulations that allow for voluntary compliance of regulations (versus enforced restraint) are examples of lighthanded strategies. These techniques tend to be less restrictive management interventions that strive to retain visitor freedoms (Hammit and Cole 1987 and Nash 1990). For example, using interpretive signs, brochures, and/or programs that persuade visitors to respect and protect a park’s resources would be considered lighthanded methods. In comparison, informing visitors they are being watched at all times by law enforcement personnel that can issue tickets leading to heavy fines for any illegal acts would be considered heavyhanded.
First, it is important to understand the recreation experience. When humans embark upon a recreation experience, they may be seen as seeking to fulfill needs not met in everyday life. In a study by Lounsbury and Polik (1992), vacation satisfaction was associated with a relatively small set of met needs. Each individual tends to have a unique set of needs to fulfill (Mannell and Iso-Ahola 1987). For example, needs that have been used in understanding recreation behavior include: learning, exploration, social contact, family togetherness and status seeking (Driver and Tocher 1970, Schreyer and Roggenbuck 1978, Wellman et al. 1982, and Tinsley and Tinsley 1986). What may be more important than identifying the specific needs of individuals is their freedom to meet their unique set of needs. Therefore, the greatest freedom should be afforded park visitors. However, problems may arise when visitors are allowed to freely meet their needs. Some visitors may be trying to fulfill a need to collect unique souvenirs from their travels to show friends when they return home as a way to seek status (Belk 1985). Others may have impulsive urges to pick up something that catches their eye, without giving much thought to the action itself (Formanek 1991). Still others may feel fulfilled by getting away with something illegal.

An individual’s need for social contact and family togetherness may also influence his or her behavior. One’s behavior may at times largely depend on his or her “personal communities” (e.g. family, friends, etc. (Stokowski 1994)). Therefore, a park visitor’s behavior may be a reaction to the influences of his or her personal community in a park setting. For example, the reason a person has for taking a piece
of petrified wood may be a response to his or her personal community that indirectly fulfills an individual need. The point is that one can think of a myriad of reasons why a person might collect a piece of petrified wood, how that behavior may fulfill an individual's needs, and how one's social group influences actions taken during a park visit.

Therefore, the problem park managers face is how to allow visitors enough freedom in a park experience to come away feeling "satisfied" while protecting the resource for perpetuity. The most effective solution might be to place fences or rangers at every area experiencing petrified wood theft. However, this may seriously limit a visitor's interaction with the environment, not to mention the probable expense and intrusion on the site. As a result, many needs that could have been met without damaging the resource are not met, and visitors needlessly go home with an empty feeling inside.

A Model of Noncompliant Behavior

Human behavior and behavior change theories are important to developing a clearer understanding of petrified wood theft and designing effective intervention programs. In a perfect world, parks would provide visitors with every freedom available so that they could fulfill their recreational needs, and the visitors would respect and protect the park's resources for future generations. However, since many visitors don't behave this way, one must look to the paradigms of human behavior to understand why people do what they do, and how undesirable behavior can be changed and/or controlled. Vincent and Fazio (1992) list normative constraints, expectations, the existence of a vested interest
in the attitude object, levels of moral reasoning, and self monitoring as significant variables in understanding behavior.

In an effort to more fully understand what drives petrified wood theft, an eclectic approach was chosen that melds together the theory of reasoned action (Ajzen and Fishbein 1980), the theory of planned behavior (Ajzen 1985, 1987. Ajzen and Driver 1991 & 1992), the theory of attitude accessibility (Fazio et al. 1983, Fazio 1986, and Vincent and Fazio 1992), and the four-component model of morality (Rest 1986a). Figure 2 illustrates how these theories are combined to understand petrified wood theft from a moral reasoning perspective.

Figure 2: Understanding Petrified Wood Theft from a Moral Reasoning Perspective
Moral reasoning was chosen as the focal point of the model since the decision on whether or not to take a piece of petrified wood may ultimately be framed as a moral dilemma. Moral reasoning can affect behavior by how one evaluates outcomes, looks upon significant others, and reacts to a situation (Dustin 1985, Rest 1986a, and Christensen and Dustin 1989).

Theory of Reasoned Action

The theory of reasoned action has been used in a variety settings to explain why people do or do not engage in a particular behavior (Fishbein and Manfredo 1992). Specific to recreational settings, the theory of reasoned action has been used to predict recreation behavior (Young and Kent 1985, Ajzen and Driver 1991 & 1992), and to predict the effects of interpretive messages on behavior change (Cable et al. 1987, Manfredo et al. 1990, Manfredo and Bright 1991, and Bright et al. 1993). The theory of reasoned action deals with how an individual's beliefs, attitudes, norms, and intentions translate into behavior. Intentions are formed by a combination of attitudes and norms. A person's attitude toward a particular behavior is formed by a person's belief that a certain outcome will occur and an evaluation of that outcome. A person's norm is formed by what the person believes salient individuals or groups think he or she should do and his or her motivation to comply with those individuals or groups (Fishbein and Manfredo 1992). For example, following the theory of reasoned action, a person may take the following into consideration: (1) the belief that it is all right to take a small piece of petrified wood from the park. (2) the subjective
evaluation of taking a small piece of petrified wood is good because family members could learn about petrified wood. the park has so much petrified wood, and there is little chance of being caught by a ranger. (3) the individual's perception that his or her significant others would approve, but the Park Service and society would not approve, and (4) a belief that what others in one's own social group (e.g. family members) think is more important than what the Park Service and society think. From these thoughts would come the attitude that it is all right to take a small piece of petrified wood, and the norm from salient individuals and/or personal communities that it is good to take a piece of petrified wood. This person's intention would then likely be to take a piece of petrified wood. However, intentions have sometimes been found to have low predictive validity for determining behavior (Fishbein and Manfredo 1992).

**Theory of Planned Behavior**

The reason why intentions sometimes do not predict behavior very well could be due to how intentions are determined. The theory of planned behavior (Azjen 1985 & 1987. Azjen and Driver 1991 & 1992) added perceived behavioral control to the theory of reasoned action to account for past experience, anticipated impediments and obstacles. Perceived behavioral control can be summarized as the perceived ease or difficulty of performing a behavior. By including this new factor, the ability of a person’s intentions to predict behavior was increased.

For example, a person may have collected illegal souvenirs from national parks in the past without experiencing any significant
impediments or obstacles. Given this past experience, one would expect that such a person would perceive that collecting a piece of petrified wood for a souvenir could be done with relative ease. Including this past experience along with positive attitudinal and normative beliefs toward petrified wood theft, the probability that a person's intention is in fact to take a piece of petrified wood should increase along with the intention's ability to predict behavior. On the other hand, if a person's past experience included being caught and fined for collecting illegal souvenirs from a national park, his or her attitudinal and normative beliefs which predicted an intention to take a piece of petrified wood would be countered by his or her perceived behavioral control, which brings the negative experience of the past to bear on the present situation.

**Theory of Attitude Accessibility**

The theory of attitude accessibility (Fazio et al. 1983, Fazio 1986, and Vincent and Fazio 1992) can also be helpful in understanding why intentions do not predict behavior in some situations. This theory recognizes that even when people have the "proper" attitude, they don't always act accordingly. For example, a person may profess to hold the attitude that "national parks should be preserved in as pristine a condition as possible" in a questionnaire, but they collected a piece of petrified wood for a souvenir. In this situation, their actual behavior may be perceived to contradict the attitude measured by the questionnaire. The theory of attitude accessibility would explain this
contradiction by examining the process of attitude selection as it relates to behavior.

The theory recognizes that behavior is a function of perception. Therefore, how a person behaves in a given situation depends partially on how a person perceives that situation. The person described in the above example may have perceived that his or her removal of petrified wood from the park did not affect the park's "pristineness" and consequently did not contradict existing attitudes. The theory also recognizes that attitudes can guide perceptions. Following the above example, if a person holds the attitude that taking one small piece of petrified wood will not affect the pristineness of the park, the person would perceive that his or her attitude and actions are not conflicting.

The theory of attitude accessibility considers two explanations in understanding why attitudes do not always predict behavior. First, sometimes attitudes may never be accessed. This may be regarded as thoughtless behavior (Vincent and Fazio 1992). For example, some people that take a piece of petrified wood from the park may never go through the thought process outlined in the theory of reasoned action/planned behavior. A beautiful piece of petrified wood may simply catch their eye and they pick it up without considering their attitudinal and normative beliefs (Formanek 1991).

Second, in situations where attitudes are activated, contextual cues will influence the selection of attitudes (Vincent and Fazio 1992). In essence, a person may have many attitudes that apply to a given situation. However, there are a myriad of contextual factors that determine which attitudes are selected for a given situation.
Therefore, when people fill out a questionnaire at home, the context in which they are operating is quite different from that of a national park where the behavior of interest occurred. For example, people at home may respond to survey questions by providing answers that they believe park officials want to hear. While at the park, people may not be considering what park officials want, but what significant others who approve of collecting petrified wood desire and thus may behave contrary to the rules.

The contextual factors account for the uniqueness of the situation in which the behavior takes place. Context could include social circumstances or physical features that serve as cues for behavior. For example, Heberlein (1971), Finnie (1973), Geller et al. (1980), and Iso-Ahola and Niblock (1981) found that physical cues (e.g., placement of attractive trash receptacles and amount of litter present) were important in understanding littering behavior. Roggenbuck and Passineau (1986) in studying littering behavior found that role modelling was a salient social cue for children. These contextual items give a fuller understanding to theft behavior. For example, a person may have the intention to take a piece of petrified wood, but the situation provides strong cues that override that intention. Group characteristics, the presence of a ranger at the site, the number of people on the site, and the physical layout of the site are a few examples of situational variables that provide context to understanding theft behavior.

The theory also examines how past experiences may affect attitude accessibility in two ways. First, attitude accessibility is determined by repeated expression. This determinant recognizes that one's attitude
toward a given object becomes more accessible with increased exposure (Vincent and Fazio 1992). For example, the greater number of times a person associates a particular attitude with a specific object, the more accessible that attitude will be toward the object. Specifically, if people encounter repeated anti-theft messages during their park visit, they may be more likely to access the attitude that it is wrong to remove petrified wood from the park at the crucial moment of temptation.

Second, attitude accessibility is determined by direct experience (Vincent and Fazio 1992). An attitude that is developed by direct experience has been found to lead to behavior that more is consistent with the attitude. This may be best understood in the context of the perceived behavioral control example above. When a person has experienced first-hand that collecting from national parks has positive results, he or she is more likely to hold the attitude that it is all right to collect in a national park than a person who only hears stories about collecting. For example, a person who holds the belief that it is wrong to collect petrified wood from a national park may see that belief change if he or she repeatedly succumbs to normative pressures to take petrified wood.

To sum up how past experiences affect attitude accessibility, a person may be more likely to hold a highly accessible attitude that it is all right to collect items from national parks when they have repeatedly collected in the past with few, if any, negative experiences. These past behaviors can be thought to "prime" intentions by increasing the accessibility in one's memory of an attitude toward a specific behavior. Following the theory of attitude accessibility, if a person
has repeatedly collected illegal souvenirs from parks in the past, a positive attitude toward that behavior will be more easily accessible than the "proper attitude."

The Four-Component Model of Morality

When an individual is faced with an ethical decision such as to collect or not collect illegal souvenirs from a national park, his or her decision making process operates in the context of moral reasoning. In such a situation, the theories of reasoned action, planned behavior, and attitude accessibility function in a moral reasoning environment. The only instance when moral reasoning would not play a role in understanding petrified wood theft is when the behavior is completely thoughtless as defined by the theory of attitude accessibility. Perceived behavior control may also play a significant role in thoughtless behavior. For example, when one's past experience is to repeatedly collect illegal souvenirs from national parks without any form of negative experience, it may be predicted that this behavior will become thoughtless over time (Vincent and Fazio 1992). Therefore, only thoughtful behavior will be considered in the discussion of moral reasoning.

Rest (1986a) describes morality as being founded in both the social condition and the human psyche. In the social setting, morality guides decision making processes to provide the foundational principles for social organization. Rest (1986a, p.1) using Rawls (1971) justice terminology states "it is morality's special province to provide guidelines for who owes whom what, to provide guidelines for determining
how the benefits and burdens of cooperative living are to be distributed."

In terms of the human psyche, morality is considered grounded in human development concepts such as empathy, intimate relations, self-concept system, and social cognition (Rest 1986a). Empathy provides one with a sense of connectedness to surrounding social environments. Through this connectedness, one may identify with and understand more fully the situations of others. When one is able to empathize with others, relationships may be formed that are based on care and mutual respect (Rest 1986a). These relationships with others may fulfill the needs of one's self-concept. To illustrate this point, an individual typically likes to be viewed by others as being concerned, caring, understanding, decent, and fair. An individual's view of his or her social world may be seen as developing with one's ability to empathize, develop intimate relations, and define self. The more one empathizes, develops intimate relations, and defines self in ways mentioned above, the less egocentric he or she will become. As an individual's social cognition develops, one starts to understand his or her place in a larger social network (Rest 1986a).

To better understand the complexities of the moral decision making process, Rest (1986a) describes the four-component model of morality. This model includes four fundamental psychological processes that a person must go through in making a moral decision. These processes include: interpreting the situation, making a judgment from the interpretation, giving moral values priority over other values, and having adequate personal attributes to follow through with one's
intention (Rest 1986a). Understanding one's moral behavior is dependant on understanding each of these four psychological processes.

**Component 1 - Interpreting the Situation**

This is where the theories of reasoned action, planned behavior, and attitude accessibility fit into understanding the process of moral reasoning. These theories help to understand how an individual interprets a given situation which requires a moral decision. This component is essentially operating in the "evaluation of outcomes" and "social motivations" blocks of the model presented in figure 2. For example, a park visitor would process situational cues (e.g., ranger, possible fines, social group) to evaluate the consequences of his or her behavior. After completing this psychological process, a person would have a list of possible behaviors and their corresponding consequences. It is important to note that there are several significant factors which will shape the items on the list (Rest 1986a).

First, it is difficult for people to interpret situations. People may be blind to certain aspects of a situation. For example, what may serve as a cue to one person may be missed by another. Second, there is a vast difference in how people evaluate the needs and welfare of others. Some individuals may be much more sensitive to the moral implications of collecting petrified wood from a national park than others. Third, people in certain social situations may have strong feelings develop with a limited amount of cognitive encoding. Therefore, a person may just have a strong feeling to take a piece of petrified wood due to his or her recent or immediate social situation.
Understanding how an individual interprets a given situation is important to understanding how these interpretations affect one's judgments.

**Component 2 - Making Moral Judgments**

Component 2 takes the list of behaviors and their outcomes from component 1 and judges them from a moral perspective. A person would consider how the outcomes of his or her behavior fall in line with his or her moral values. The behavior with the outcome that is judged to be the most right and the least wrong in the context of an individual's moral values would be selected as the morally correct behavior for a given situation.

Most moral reasoning studies fall into this component. They have approached moral reasoning from a cognitive development perspective from either a justice or care orientation. The earliest work from a justice orientation was conducted by Jean Piaget in the 1930's. Piaget was the first to suggest that a person progresses from one stage of moral reasoning marked by blindly accepting rules from authority to another stage of modifying rules to fit a given situation. During the 1960's and early 1970's Lawrence Kohlberg developed his six stage theory of justice reasoning by generally following the organization and structure laid down by Piaget (Cortese 1987). Kohlberg's method to assess moral development involved a lengthy interview procedure and was therefore impractical to apply in many field settings. Given this, Rest (1979, 1986b) developed the Defined Issues Test (DIT) that could be incorporated into a survey questionnaire (Rest 1986a). Piaget.
Kohlberg, and Rest operationalized their moral development measures by presenting subjects with hypothetical moral dilemmas and asking them to judge what is right and wrong (Rest 1986a).

Gilligan (1982) was responsible for bringing attention to the care orientation of moral reasoning. She argued that justice reasoning did not fully explain cognitive moral development as Kohlberg saw it and felt that real life moral dilemmas would more accurately assess moral development than Kohlberg's hypothetical moral dilemmas. From Gilligan's work came revisions to Kohlberg's theory, opening up a great philosophical debate on what comprises moral reasoning and how it should be studied (Larrabee 1993). It is important to note from a philosophical perspective that there are many other possible moral orientations, including community, honesty, courage, and prudence (Rest 1986a and Blum 1988/1993). However, developmental cognitive psychologists have mainly focused on the justice (e.g. Kohlberg 1976, 1984, and 1986) and care (e.g. Gilligan 1982) orientations.

Component 3 - Moral Versus Personal Values

The third component of the model recognizes that people hold personal values that may conflict with their moral values. For example, a person may value a piece of Petrified wood for a souvenir (personal value) more than what is just and caring as it relates to others (moral value). Therefore, how a person answers a question on the DIT may have little to do with his or her actual behavior. A person may be classified as being very concerned with justice and care for others, but still behave in a contradictory way in a real life situation. The DIT
attempts to measure one's moral values, however one's personal values (desire to have a piece of petrified wood) may be much more important in determining behavior (Rest 1986a).

Component 4 - Ability to Follow Through

From the theories of reasoned action and planned behavior it was noted that intentions do not always predict behavior. Component 4 of the model provides some possible reasons why this may be so. Carrying out one's intentions depends on several factors. A person's resolve and implementation skills to behave as intended are critical (Rest 1986a). For example, a person may intend not to collect petrified wood while visiting the park. However, his or her intention is only as good as his or her resolve and implementation skills to carry through with the intention. Therefore, if a person has weak resolve and/or poor implementation skills and the situation is such that he or she is confronted with pressure from his or her social community to take a piece of petrified wood, he or she will likely fold under the pressure.

Moral Reasoning Literature Review

The remainder of this chapter focuses on literature pertaining to moral reasoning. From the time of Piaget in the early to mid-1900's until the present, moral development theories have undergone continual development, refinement, and re-definition. Two major moral development perspectives have emerged during the past thirty years. One is a justice orientation that essentially developed from Lawrence Kohlberg's stage theory (Kohlberg 1976, 1984, & 1986) and the other is a care
orientation that Carol Gilligan proposed and examined in her book *In a Different Voice* (Gilligan 1982 and Blum 1988/1993). These two orientations are discussed below by examining their main points and criticisms. While it is recognized that there are many other possible moral orientations, justice and care have received the most attention in cognitive developmental psychology research. Therefore, the justice and care orientations will be the focus of this study.

**Justice Judgments and Reasoning**

Kohlberg, building upon Piaget’s cognitive development perspective, theorized six stages of moral development. Kohlberg’s stage theory suggests that there is an orderly step-by-step progression of moral development that culminates with principled justice reasoning that operates context free (Broughton 1983). The six stages are grouped into three levels (two stages per level) of moral reasoning: preconventional, conventional, and post-conventional or principled.

**Preconventional Level of Morality**

When evaluating the consequences of an action, a person operating at the preconventional level of morality will be predominantly concerned with how he or she will be affected by the consequences. The possible consequences to others will only be considered as it relates to some idea of exchange. *Stage one morality* judges right and wrong by knowing the rules and their associated penalties. Bad actions are defined by their punishment. People in positions of power are recognized as being superior authorities for determining what is right or wrong. At this
stage, a person does not recognize that there is a difference between his or her interests and the interests of others (Kohlberg 1976, 1984, and 1986). For example, a person operating at stage one morality would likely not collect petrified wood if he or she knows the Park Service rules regarding collecting and recognizes the Park Service as an authority, since society through the Park Service has defined this behavior as bad through establishing fines. One would recognize that this type of behavior is seen as unacceptable by a superior authority and be obedient to the rule. The interest of the authority essentially becomes the interest of the individual. At this stage, one's behavioral intention is determined by the social motivation to comply with the authority figure (e.g. significant other, institution, society) that presides over the situation.

Stage two morality judges right and wrong from an individualistic perspective. A person no longer recognizes superior authorities and thus their definition of what is bad. However, the person recognizes that others have interests that may or may not conflict with his or her own interests. In essence, all people/organizations are viewed as being equal with their own interests to pursue (Kohlberg 1976, 1984, and 1986). At this stage, the Park Service is viewed as an individual or group of individuals who have a certain interest (e.g. protecting petrified wood). An individual may now find that his or her interests are in conflict with the rules of others. Now the question of petrified wood theft is open to a myriad of individual evaluations. No longer is the Park Service the authority on right and wrong. People operating at this stage of morality follow the rules only when it is in their own
interest. Therefore, if a person finds it in his or her interest to collect a piece of petrified wood, he or she would evaluate trade-offs between possible punishments and gaining something he or she desires. At this stage, one's intention is determined by evaluating the outcome of an action.

**Conventional Level of Morality**

At the conventional level of morality, a person is concerned with social expectations, recognizing the rights of others, and accepting the current social order. A person operating at *Stage three morality* determines what is right by evaluating what people close to him or her think and what society generally expects from a person filling a given role (e.g., daughter, father, friend, etc.). An individual is motivated to do what is right by a need to view oneself as good, have others view oneself as good, and the golden rule ("Do to others as you would have them do to you" Luke 6:31 (New International Version 1978)). One recognizes differences in individual interests and integrates them into general social expectations (Kohlberg 1976, 1984, and 1986). Therefore, an individual would judge the action of collecting petrified wood by how others would view it and how one would feel if it was done to himself or herself. The values of significant others, institutional values, and societal values are important in judging a behavior. At this stage, one's intention is determined primarily by social motivations. Outcomes are evaluated in terms of how a certain action will affect or be viewed by others.
Stage four morality goes beyond stage three by understanding one's place and role in a social system. What is right is based on fulfilling agreed to duties, impartial laws/rules of formal legal or social institutions, and higher moral or religious laws of one's conscience. An individual is motivated to do what is right by wanting to maintain institutions and to act consistently with imperatives of his or her conscience. Only in extreme cases of conflict between one's conscience and institutional laws/rules can abandoning these legal/social institutions be justified (Kohlberg 1976, 1984, and 1986). At this stage, one's intention is determined by a more complete understanding of outcomes and social motivations. A thoughtful individual operating at stage four most likely would not collect petrified wood, since he or she would want to uphold the regulations of the Park Service to maintain the system. It is doubtful that a person's conscience would differ in such an extreme way as to cause him or her to break institutional laws/rules.

Post-Conventional Level of Morality

The post-conventional level of morality is marked by self-chosen moral principles. A person at this level is aware of universal principles that would apply to building any moral society without having legal or social institutions dictate what is right. The laws/rules of society are now evaluated against one's own moral principles.

Stage five morality recognizes that one freely enters a contract with the rest of society to preserve the rights and welfare of all members. What is morally right is determined at an individual level. The laws/rules of society are evaluated against one's principles of
human rights and values. Stage four morality is motivated to maintain society, while stage five morality may be more involved with changing society to follow one's principles. An individual ultimately judges what is right by how the consequences of a given action affects the welfare of each person or group in society. At this stage, an individual's intention is determined primarily by one's own personal and moral values, rather than the laws/rules of society (Kohlberg 1976, 1984, and 1986). A thoughtful person operating at this stage should come to the conclusion that it is not in the best interest of others in society for him or her to collect petrified wood.

Stage six morality goes beyond laws/rules of society. A person follows his or her own set of self-chosen ethical principles of justice. Social agreements are usually upheld since they should be based upon these universal ethical principles. However, if there is a conflict, one's ethical principles will continue to serve as the guide for behavior. A person fully believes that there are universal moral principles that transcend the laws/rules of society, and he or she is completely committed to these principles. These principles are also to apply to all situations. An individual determines what is right by evaluating the consequences of one's actions based upon how they would impact upon all individuals concerned. At this stage, an individual's intention is determined entirely by one's own personal and moral values, rather than the laws/rules of society. Essentially, stage 6 differs from stage 5 by going beyond a fixed contract with society. At stage 6, a person would evaluate a moral dilemma by examining how others would feel from all perspectives in an iterative process. For example, a
person operating a stage 6 reasoning would take the point of view of the other park visitors. society, and himself or herself. At this point stage 6 is the same as stage 5. however stage 6 would require these parties to go beyond this point by taking the point of view of each other and modify their claims (Kohlberg 1976, 1984, and 1986). A thoughtful person operating at stage would again come to the conclusion that it is not in the best interest of others in society for him or her to collect petrified wood.

**Criticisms of Kohlberg's Stage Theory**

There have been many criticisms placed on Kohlberg's stage theory. The early criticisms were put forward Gilligan who worked with Kohlberg in the early 1970's as a graduate student (Larrabee 1993). Gilligan criticized Kohlberg's use of hypothetical moral dilemmas, assessment of morality, and use of only male test subjects. Other criticisms followed that questioned the universality of the theory to all situations, the universality of the theory to non-western cultures, changes in the scoring methodology over the years, and the "hard" stage transitions (Flanagan and Jackson 1987).

The use of hypothetical moral dilemmas is a particularly concerning point for several reasons. First, since the subjects were presented with a list of possible courses of action for a contrived moral dilemma, the first component of the four component model was given to the subjects. They were not required to generate their own list of possible behaviors and associated consequences. Second, how one would actually behave is not known. The measures do not consider the
importance of how a person would actually prioritize his or her values in the context of a real situation, and how one's perseverance, ego strength, and implementation skills would affect behavior (Rest 1986a).

**Care Judgments and Reasoning**

Gilligan's dissertation attempted to address some of her concerns with Kohlberg's work and supplement it by studying individuals going through real-life dilemmas. Gilligan interviewed twenty-nine women who were considering whether or not to have an abortion (Brake 1983 and Larrabee 1993). From this work came Gilligan's theory which approaches morality from a care and responsibility orientation rather than Kohlberg's justice orientation. This theory consists of three levels and two transitions between levels of care (Brake 1983).

**Gilligan's Theory**

A person operating at the first level of care is concerned only with what is good for himself or herself. The paramount concern is to avoid hurt and to further self-survival. As a person transitions to the second level, he or she becomes more concerned with others through attachments and connections that have been formed. The self is no longer the only focus. At the second level, a person is concerned with not hurting others. One is motivated to care for others by the need for approval. As a person transitions to the third level, he or she starts to understand the need for responsibility. This responsibility focuses on oneself and others. At the third level, one is able to resolve the conflict between selfishness and responsibility to self. Care and
responsibility for self and others is motivated by one's self-chosen ethical principles (Gilligan 1982).

Many similarities exist between Gilligan's ethic of care and Kohlberg's stage theory. Broughton (1983) states the first level is quite similar to preconventional level, second level is similar to stage 3, and the third level is not that different from the post-conventional level. However, there remains important differences between the two theories. Gilligan's theory emphasizes care, relationships, connection, and attachment, while Kohlberg's theory emphasizes justice, rights, fairness, respect, and universal principles (Brabeck 1983).

Criticisms of Gilligan's Theory

Larrabee (1993, p.5) states "critics have questioned Gilligan's methodology and her conclusions, as much for their lack of 'empirical vigor' as for the tenuousness of the evidence." Blum (1988/1993) questions Gilligan's assertion that there are only two moral voices (i.e. justice and care). He suggests that there are many other possible orientations of morality, such as "community, honesty, courage, [and] prudence" (Blum 1988/1993, p. 58). Nicholson (1983/1993) addresses the question of gender and cultural bias by stating "it could be said that Gilligan's stage model of moral development is as biased against non-Western, nonwhite, and non-middle-class women as was Kohlberg's, only now minus the sexism" (p.100).

Gilligan's research did more to open up a philosophical debate about how to approach moral reasoning development than to provide additional understanding through empirical results. Gilligan raised the
awareness of other possible moral orientations by suggesting that Kohlberg narrowly focused on justice and missed an equally important orientation of care. In responding to her critics Gilligan (1986/1993) stated:

...my critics claim that there are no sex differences in moral development because there are no sex differences on the Kohlberg scale. Thus they completely miss my point. My work focuses on the difference between two moral orientations -- a justice and a care perspective rather than on the question of whether women and men differ on Kohlberg's stages of justice reasoning (p.210).

Application of the Justice and Care Moral Reasoning Orientations

Given the criticisms of Kohlberg and Gilligan one must proceed cautiously when using their theories of moral reasoning development. Recognizing the limitations of the theories is paramount when considering their applicability to inform other areas of understanding such as petrified wood theft. It is prudent to not press the theories to their outer limits of understanding, but to conservatively apply the developmental stages/levels. This is the intent of this study. Rather than focusing on the differences between Kohlberg and Gilligan, this study draws upon the similarities outlined by Broughton (1983).

Therefore, Kohlberg's three levels and Gilligan's three levels are meshed together to inform petrified wood theft. This is similar to an approach used by Christensen and Dustin (1989) to evaluate the content of interpretive messages commonly found in park settings. In the context of this study, moral reasoning stages/levels are simplified into three levels: preconventional, conventional, and post-conventional.
Preconventional Level

This level focuses on the self. It is essentially a combination of Kohlberg's second stage and Gilligan's first level. It is inappropriate to include Kohlberg's first stage, since it must be assumed that park visitors would be able to recognize that there are differences between their interests and the interests of others. Thus, Kohlberg's second stage of maximizing pleasure and minimizing pain is combined with Gilligan's first level of self survival. Simply stated, park visitors who desired to collect petrified wood would try to avoid punishment while satisfying their desire to collect.

Conventional Level

At the conventional level, a person is concerned about the welfare of others. From Kohlberg's stage three and four comes the importance of social expectations, recognizing the rights of others, and accepting the current social order. Gilligan's second level adds the importance of pleasing others. Simply stated, a park visitor at this level would have to weigh the importance of all salient social groups (e.g. family, friends, and social institutions) in determining his or her behavior.

Post-conventional Level

At this level, the self becomes more important in determining what is a just, fair, and caring behavior. Kohlberg's stage five and six brings in the idea of universal justice. Gilligan's third level adds the idea of care. Therefore, a person acting at this level would be
concerned with what is just, fair, and caring for others. Others at this level may become very broad to include, for example, future generations and the rights of the earth.

**Study Hypotheses**

Study hypotheses revolve around the concept of moral reasoning. However, the first study hypothesis deals with the situation where moral reasoning is by-passed when one acts out of thoughtlessness (e.g. habit or impulsiveness) as defined by Vincent and Fazio (1992) in the theory of attitude accessibility.

**H1: Thieves will be more thoughtless than non-thieves.**

The second and third study hypotheses are developed from the logic that a person who is concerned about the threat of punishment for collecting petrified wood, must be considering collecting petrified wood.

**H2: Park visitors who score high on the preconventional moral reasoning measure relating to petrified wood theft will have a greater likelihood to collect a piece of petrified wood than park visitors who score low on the same measure.**

**H3: Park visitors who score high on the preconventional moral reasoning measure relating to petrified wood theft will have a higher propensity to be collectors than park visitors who score low on the same measure.**

The fourth study hypothesis comes from the theory of reasoned action and the theory of planned behavior which considers that a
person's attitudes are based upon antecedent beliefs. Therefore following the logic of the previous study hypothesis, it can be concluded that people who are collectors may justify their collecting behavior through their attitudes. This ties in with the theory of attitude accessibility where it is recognized that attitudes can guide perceptions and that repeated collecting behavior can change attitudes to come in line with the behavior. Thus, for example, collectors may feel that removing one small piece of petrified wood is not a serious violation of park rules, especially if they have performed some type of collecting in the past without having a negative experience.

**H4:** Park visitors who score high on the preconventional moral reasoning measure relating to petrified wood theft will agree less with statements regarding the proper treatment of petrified wood than park visitors who score low on the same measure.

The next two study hypotheses are guided by moral reasoning theory. A person operating at the preconventional level of moral reasoning who was planning on collecting a piece of petrified wood would try to minimize pain and avoid punishment. Therefore, they would spend more time at sites with a low threat of punishment and less time at sites with a high threat of punishment.

**H5:** Park visitors who score high on the preconventional moral reasoning measure will spend more time at petrified wood sites with a low threat of punishment than park visitors who score low on the same measure.
H6: Park visitors who score high on the preconventional moral reasoning measure will spend less time at petrified wood sites with a high threat of punishment than park visitors who score low on the same measure.

The next three study hypotheses deal with the moral reasoning levels of thieves. It is hypothesized that thieves are going to be more concerned with avoiding punishment than with following the park's rules or preserving the park's pristineness.

H7: Thieves will score higher on preconventional moral reasoning measures relating to petrified wood theft than non-thieves.

H8: Thieves will score lower on the conventional moral reasoning measures relating to petrified wood theft than non-thieves.

H9: Thieves will score lower on the post-conventional moral reasoning measures relating to petrified wood theft than non-thieves.
CHAPTER THREE: METHODS

Study Areas

Five petrified wood sites (Blue Mesa, Crystal Forest, Giant Logs, Jasper Forest, and Long Logs) within the boundaries of PFNP were included in this study. Two of the areas, Crystal Forest and Long Logs, were studied intensively (i.e. rate of petrified wood theft was observed and efforts were made to describe thieves in terms of socio-demographic and other characteristics). All five areas were included as representing a range in the likelihood of receiving punishment for collecting petrified wood.

Observed Areas

Observation of park visitors was conducted at Crystal Forest and Long Logs. These sites were selected as observation areas for essentially three reasons. First, they contain an ample supply of petrified wood on the ground. Second, they are two of the most popular petrified wood sites, and a majority of the petrified wood theft appears to occur at these sites. Finally, the physical layout and location of

the site within the park were conducive to observation and surveying of thieves and non-thieves.

Crystal Forest

Crystal Forest is located adjacent to the main park road approximately 17 miles south of the north entrance station and ten miles north of the south entrance station. Pieces of petrified wood in many shapes, sizes, and colors lay scattered across the landscape that surrounds the parking area. A short (0.8 mile) paved loop trail provides visitors an opportunity to walk through this area of gently rolling badlands. The trail begins and ends at the same parking lot trailhead. Few small pieces of petrified wood remain along the trail near the parking lot. However, small, hand sized pieces of petrified wood literally cover the ground within 100 feet of the trail. The only on-site anti-theft messages the Park Service provides visitors is one sign and statements or warnings by an occasional ranger. The sign, located near the trailhead at the parking lot, states that "removal of petrified wood is prohibited."

Long Logs

Long Logs is located approximately 24 miles south of the north entrance station and three miles north of the south entrance station. It is accessed from the main park road by a short spur road that leads to a parking area. In many ways, Long Logs is very similar to Crystal Forest. The most notable differences are that Longs Logs has more trails, and more hand sized pieces of petrified wood near these trails.
even near the parking lot. There are two trailheads at the parking lot. One trailhead serves as the starting point for the Long Logs loop trail (0.6 mile) and the Agate House spur trail (1 mile round trip). The other trailhead is the ending point of the Long Logs loop trail. Both the Long Logs and Agate House trails are paved. Several short informal unpaved trails cut across between sections of the paved trails passing through areas that contain high concentrations of hand sized pieces of petrified wood. All of the trails provide visitors many opportunities to come into close contact with the petrified wood. The only anti-theft messages at this site, besides the occasional ranger, are embedded within other information about the park in a glass display case at the ramada located near the trailhead. Information in the display case is changed on a regular basis to inform visitors of special park events or occurrences. Typical anti-theft messages included with the display case information are a warning of possible prosecution for collecting petrified wood and/or appeals for assistance in preserving the park's petrified wood resource.

Areas Not Observed

Blue Mesa, Jasper Forest, and Giant Logs were not selected for observation for a variety of reasons. Most importantly, fewer visitors take the time to drive to Blue Mesa; Jasper Forest does not have a trail system; and theft is not perceived as a problem at Giant Logs. However, these sites are important in addressing the fifth and sixth hypotheses of the study. These hypotheses state that visitors operating

at the preconventional level of moral reasoning will seek out areas with a low threat of punishment and avoid areas with a high threat of punishment.

**Low Threat of Punishment Areas**

The threat of punishment at Blue Mesa, Crystal Forest, Jasper Forest, and Long Logs is relatively low. All of the sites are remote from any park buildings and only occasionally have rangers on-site. Without much effort, a park visitor can be out of sight of others and easily collect a small piece of petrified wood for a souvenir without being concerned about being caught and fined. These areas all have a seemingly abundant supply of hand sized pieces of petrified wood, some with very attractive coloring and crystal formations.

**High Threat of Punishment Area**

Giant Logs has most of the same petrified wood attributes as the four sites mentioned above, but it is located directly behind the Rainbow Forest Museum and is surrounded by an iron fence. It has a short (0.4 mile) paved loop trail winding through large petrified wood logs and a myriad of small hand sized pieces very similar to Long Logs and Crystal Forest. However, to visit this site one must enter and exit through the museum and be in sight of the museum almost all of the time. Even if there is not an actual threat of punishment, most visitors must perceive that this area is tightly controlled. Therefore, the threat of punishment is much greater at this site than the other four sites.
Study Populations

This study consists of one main study population, all PFNP visitors, and two sub-populations. The first sub-population consists of PFNP visitors who were observed removing petrified wood from an area under observation. The second sub-population consists of PFNP visitors who were not observed removing petrified wood from an area under observation.\footnote{The visitors included in this sample may have collected petrified wood at other locations within the park. However, they were not observed to have removed petrified wood from the site under observation.}

Population Sample

A sample from the total population of park visitors was drawn using a stratified clustering scheme. The sampling design incorporated partitioning the sampling period, May 1, 1993 through August 31, 1993 by month, which yielded four strata. These four strata were then divided by time of day (morning (9:00 a.m. to 12:00 p.m.), mid-day (12:30 p.m. to 3:30 p.m.), or late afternoon/early evening (4:00 p.m. to 7:00 p.m.)) and exit location (north or south), resulting in six sampling blocks per month for a total of 72 hours of sampling (4 months \( \times \) 6 sampling blocks per month \( \times \) 3 hours per sampling block = 72 hours). The sampling blocks were randomly selected. A systematic sampling interval \( (k) \) was used to select vehicles and individuals within the vehicles for each of the sampling blocks (Knoke and Bohrnstedt 1994).

The sample size for the study was determined using a standard confidence interval formula (Hays 1988, p. 238). This formula requires specification of (1) the desired confidence interval, and (2) the degree
of accuracy desired. A confidence interval of 95% and an accuracy of 
.5σ was selected. Using these values and taking into account the twelve 
sampling blocks per month, approximately 100 responses per month were 
needed to obtain the desired degree of accuracy. Multiplying this 
figure by the number of months indicated that 400 responses were 
required during the sampling period. Assuming an 80% response rate, 500 
individuals needed to be contacted to achieve the desired sample size.

The systematic sampling interval (k) was determined using the 
following steps: (1) the number of vehicles exiting the park at the 
north and south exit points for the months of May, June, July, and 
August (124,828 vehicles) was determined from PFNP's 1991 volume 
summary: (2) the combined total number of possible sampling hours (i.e. 
total number of hours the park was open) for the north and south exit 
points (3,014 hours) was calculated for the same months; (3) the number 
of proposed sampling hours was then divided by the number of possible 
sampling hours (72 hours / 3,014 hours = 2.4%) to determine the 
percentage of the time either the north or south exits points would be 
sampled; (4) the number of vehicles exiting during the sampling blocks 
was determined by multiplying the total number of vehicles by the 
sampling percentage determined in the previous step (124,828 vehicles x 
2.4% = 2,982 vehicles); (5) the systematic sampling interval (k) was 
determined by dividing the calculated total number of vehicles exiting 
during the sampling blocks by the desired sample size (k = 2982 vehicles 
/ 500 vehicles = 6). At this point, it was decided that sampling every 
sixth vehicle would not be practical during peak use periods. 
Therefore, the number of sampling blocks per month was doubled (two each
of the possible time/exit location combinations per month (144 sampling hours), resulting in a systematic sampling interval of twelve (k = 5964 vehicles / 500 vehicles = 12).

The systematic sampling interval was operationalized in the following manner: First, the initial vehicle to be stopped for a given sampling block was selected at random and every k\textsuperscript{th} (5/18/93 through 7/02/93, k = 12; 7/20/93 through 8/11/93, k = 9)\textsuperscript{8} vehicle thereafter was stopped. Second, one individual in each vehicle was randomly selected and asked to participate in the study. This was accomplished by using the random start number to determine who would be interviewed first. If the random start number was odd, the driver of the first vehicle was interviewed. If the random start number was even, the front seat passenger of the first vehicle was interviewed. After the first vehicle, the interviews alternated between the driver and front seat passenger.

**Observed Samples**

Visitor observations were conducted at Crystal Forest and Long Logs. Observation starting times were varied to sample all park operating hours. However, observation times did not overlap with the park population sampling times (i.e. no individual participating in the park population sample was observed). At Long Logs, visitors were observed in three hour time blocks. A total of thirty time blocks were

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\textsuperscript{8}The sampling rate was increased after it was determined that an insufficient number of individuals would be sampled to meet the objectives of the study. This resulted in July and August being over sampled.
randomly assigned to days and times from May 17, 1993 to June 17, 1993. Usually two time blocks, separated by an hour, were scheduled per day. At Crystal Forest, visitors were observed in four hour time blocks. Eight time blocks were randomly assigned to days and times from June 23, 1993 to July 2, 1993. One time block was scheduled per day.

During each observation time block an effort was made to track and record every theft occurrence. Individuals observed removing petrified wood from the study sites became part of the "thief" sample. The "non-thief" sample was obtained by observing the behavior of one randomly selected visitor per hour. If this randomly selected person did not remove petrified wood from the study site, they became part of the non-thief sample. If they did remove a piece of petrified wood, they reverted to the thief sample.

Data Collection Methods

Data collection methods included post-visit contacts, questionnaires, and observational techniques. The random park population sample received only the post-visit contacts with questionnaires. The thief and non-thief samples were observed, some of their characteristics noted, and they too received the same post-visit contacts with questionnaires as the park population sample.

Post-Visit Contacts

Visitors were contacted at entrance stations during sampling periods between May 18, 1993 and August 11, 1993. The initial contact was made by a National Park Service employee (at the exit station) who
would ask if the visitor was willing to participate in a study being conducted for the Park Service by Virginia Tech. If the person was agreeable to participating in the study, the ranger would ask him or her to drive over to a waiting Virginia Tech research assistant. The research assistant would select a person in the vehicle for the contact according to the sampling scheme outlined above for the park population study or by identifying the tagged individual from the observation sample (for the thief versus non-thief characteristics portion of the study). During the on-site contact, the research assistant briefly explained the study, and visitors were asked if they were still willing to participate. Those willing to participate were asked a few questions to determine basic visitor use and user characteristics (see Appendix A). Names and addresses also were collected for mailing follow-up reminders to increase response rates. Finally, research assistants handed out a survey package containing a cover letter (Appendix B), questionnaire (Appendix C), and postage-paid return envelope.

In an effort to obtain a high response rate, three follow-up reminders were used following the scheme outlined in Dillman (1978). The first was a postcard reminder (Appendix D) mailed approximately a week after the initial contact. The second follow-up was mailed approximately three weeks after the initial contact and included another cover letter (Appendix E), questionnaire, and postage-paid return envelope. The final mailing was a postcard reminder (Appendix D) mailed out about four weeks after the initial contact. The park visitor sample and the observed sample received the same follow-up procedure, except the observed sample was sent a personalized cover letter in the second
follow-up mailing. This cover letter was identical to the park visitor sample's second cover letter, except it had a personalized salutation (e.g. Dear John Doe) rather than the generic "Dear Petrified Forest National Park Visitor."

**Observation Techniques**

The observation techniques used to measure theft and non-theft among park visitors endeavored to be as unobtrusive as practical. Techniques used included: the observer being completely hidden, the observer posing as a park visitor, and an unmanned video camera in the back of a vehicle. The purpose of the observer was to record as much information as possible about the theft and provide an adequate description of the observed person and his or her vehicle for tracking purposes. The video camera was used to provide a estimate of the amount of use while the site was under observation and to provide information on the average length of stay of the visitors.

At Long Logs, observers worked in teams of two. One observer was stationed out of sight, while the other posed as a park visitor. The observers could communicate with each other by means of two-way radio. The observations at Crystal Forest were operationalized with only one observer who posed as a park visitor.

**Observer Out of Sight**

At Long Logs, an observer was assigned to monitor the site from a rock formation approximately 100 yards from the nearest trail and parking lot. Using binoculars, the observer would scan the site looking
for possible theft behavior. Once a person was spotted removing petrified wood, the observer would fill out a theft observation coding form (Appendix F) and alert the other observer, who was on-site and posing as a visitor, of the behavior.

Observer Posing as a Park Visitor

At Long Logs, the observer who posed as a park visitor wore a backpack containing a two-way radio and "walk-man" type earphones while on the trails. This person would attempt to behave in every way like a "typical" visitor by taking pictures, looking in the distance with binoculars, reading about the park, and bending over to look at petrified wood, but all the time watching for possible theft behavior. If a visitor was spotted removing petrified wood from the site by either observer or if a visitor was to be part of the randomly selected non-thief sample, the observer posing as a park visitor would follow this person back to the parking lot and note the description of the visitor's vehicle. At this point, the observer would get into his or her vehicle and record information about the "tagged" person's behavior, appearance, and vehicle.

With the information about the tagged person and his or her vehicle, the observer used a two-way radio (Long Logs) or cellular phone (Crystal Forest) to inform the research assistant located at the south entrance/exit station. The research assistant at the south entrance/exit station recorded the information and called the research assistant located at the north entrance/exit station. Neither the research assistants at the entrance/exit stations nor the park ranger
working there were informed of status (thief or non-thief) of the tagged person. When the tagged vehicle was spotted, the research assistant would request the ranger working the exit window to ask the tagged vehicle to participate in a survey of park visitors. Participation was voluntary for the tagged person. The post-visit contact interview was conducted in the same manner as the general park visitor sample.

Crystal Forest differed from Long Logs by having only one observer posing as a park visitor. This person functioned in much the same way, only there was not a second person and thus the backpack, radio, and earphones were not required.

**Video Camera Observations**

While a petrified wood site was being observed, a video camera was recording the visitor entrances and exits at the trailhead at Crystal Forest and the entrance/exit point of the Long Logs parking lot. The camera was set up on a tripod in the back of the vehicle used by the observer(s). No effort was made to conceal the camera. The tapes were later analyzed to determine the number of people using the site while the thefts were occurring and an average visitor length of stay at the two sites observed. This information also provided an estimate of the number of thefts occurring per visitor for a site under observation.

**Data Collection Instruments**

**Post-Visit Interview Forms**

The post-visit interview forms (Appendix A) were designed to provide information on length of stay, travel patterns, amount of time
spent at visitor centers, gift shops, petrified wood sites and other popular park features, group size, vehicle type, and home address. Two different forms were used for post-visit interviews, one for the north exit and one for the south exit. The main difference between the two forms was the ordering of the park features. The north exit form assumed most park visitors would travel from south to north and the south exit form assumed a north to south travel pattern. The north exit form required the respondent to estimate how long he or she was planning to spend at the Painted Desert Visitor Center, gift shop, and restaurant, since these features were outside the entrance/exit station and most visitors exiting at the north would not have had the opportunity to visit these sites at the time of the post-visit interview.

Questionnaire

An eleven-page mailback questionnaire (Appendix C) was used to collect data on: (1) socio-demographic characteristics; (2) where information about the park and its rules were obtained; (3) perceptions of resource, social, and management problems; (4) national park involvement; (5) importance of souvenir collecting; (6) attitudes pertaining to appropriate behavior in national parks; (7) judgments of relative seriousness of various illegal or inappropriate park behaviors; (8) levels of moral reasoning regarding possible theft of petrified wood; and (9) feelings about possible park management intervention programs used to reduce petrified wood theft.
To facilitate Office of Management and Budget (OMB) approval, questions from the National Park Service catalog of pre-approved questions (*Q-Cat 1991: Questions for Visitor Surveys*) were incorporated into the questionnaire whenever possible. A pre-test of the initial questionnaire was conducted on March 12 and 13, 1993. Forty PFNP visitors were contacted during this period. From this pre-test several minor changes were made to the final questionnaire, and OMB approved the questionnaire in its final form.

**Observation Coding Forms**

A two page thief observation coding form (Appendix F) provided a means to document petrified wood theft. Specifically, information was obtained on: (1) apparent socio-demographic characteristics of the thief; (2) the thief's behavior; (3) situational variables; and (4) information on the thief and his or her vehicle to facilitate tracking the person for a post-visit contact.

A similar observation coding form (Appendix G) was used for the random sample of non-thieves. The information recorded for socio-demographics, situational variables, and tracking information was identical to the thief form. The behavior section was similar, however it did not include any theft information.

**Participation and Response Rates**

Approximately 603 PFNP visitors were asked by Park Service rangers to participate in the general park survey. Of these, 456 (75.5% of 603) agreed to be interviewed by the Virginia Tech research assistants and
were given a questionnaire. Eighty percent or 365 returned a completed questionnaire.

In total, 226 park visitors were observed (125 thieves and 101 non-thieves). Of these, 145 (64.2% of 226, 77 thieves and 68 non-thieves) agreed to be interviewed and were given a questionnaire. Of the 81 who were not interviewed, 39 (17.3%) were not seen by the research assistants at the two exit/entrance stations. 30 (13.3%) slipped through the exit stations without being contacted for various reasons. 16 (7.1%) refused to participate in the study, and 1 (0.4%) was intercepted by a Park Service law enforcement ranger. One-hundred-sixteen (80.0% of 145) returned a completed questionnaire. Of these 116, 61 were thieves for a thief response rate of 79.2% and 55 were non-thieves for a non-thief response rate of 80.9%. Table 1 summarizes the post-visit interview participation rates and the questionnaire response rates.

After a careful comparison of the thief socio-demographic information recorded on the observation coding forms and reported in the mailback questionnaires, ten of the sixty-one thieves who returned a completed questionnaire were removed from the "thief" data set. A thief was removed when his or her description on the questionnaire did not match the same information on the observation coding form and the observation coding form reported the theft was an individual behavior and not a group behavior. For example, if an observation coding form recorded the thief as being a white male in his thirties acting alone, and the questionnaire was filled out by a white female in her thirties, the questionnaire was removed from the thief data set. In this case,
apparently another household member or companion on the trip completed
the post-trip questionnaire, and not the thief observed in the field.

Table 1. Participation and Response Rates

<table>
<thead>
<tr>
<th>Sample Population</th>
<th>Number Asked to Participate/Number Observed (N)</th>
<th>Number Receiving a Questionnaire (N)</th>
<th>Participation Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Park Visitors</td>
<td>603</td>
<td>456</td>
<td>75.6</td>
</tr>
<tr>
<td>Observed</td>
<td>226</td>
<td>145</td>
<td>64.2</td>
</tr>
<tr>
<td>Thieves</td>
<td>125</td>
<td>77</td>
<td>62.1</td>
</tr>
<tr>
<td>Non-thieves</td>
<td>101</td>
<td>68</td>
<td>67.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample Population</th>
<th>Number Returning a Questionnaire (N)</th>
<th>Response Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Park Visitors</td>
<td>365</td>
<td>80.0</td>
</tr>
<tr>
<td>Observed</td>
<td>116</td>
<td>80.0</td>
</tr>
<tr>
<td>Thieves</td>
<td>61</td>
<td>79.2</td>
</tr>
<tr>
<td>Non-thieves</td>
<td>55</td>
<td>80.9</td>
</tr>
</tbody>
</table>

Data Analysis Procedures

SPSS Release 4 (SPSS 1990) was used as the primary statistical analysis tool. Factor analysis was used to validate the underlaying constructs developed in the literature review section of this paper. The indicator variables used for levels of moral reasoning and
collecting traits were subjected to factor analysis (Norusis 1988). Reliability analysis was used to evaluate the consistency of response to the indicator variables obtained from the literature review and validated by factor analysis to create latent variables for preconventional moral reasoning, conventional moral reasoning, post-conventional moral reasoning, collecting trait, and impulsive collecting trait (Knoke and Bohrnstedt 1994 and SPSS 1990).

The latent variables representing the levels of moral reasoning were analyzed using Cluster analysis to group subjects with similar moral reasoning characteristics (Norusis 1988). One-tailed t-tests were used to test four of the study's hypotheses by comparing the mean scores of the sample of thieves to the mean scores of the sample of non-thieves. One-tailed t-tests were also used to test the remaining five study hypotheses by comparing the mean scores of subjects who scored high on the preconventional measure of moral reasoning to the mean scores of subjects who scored low on the same measure (SPSS 1990).
CHAPTER FOUR: LIMITATIONS

The focus of this chapter is to examine the extent and nature of the study's limitations and their implications. A number of the limitations may be attributed to the setting of the study, especially the field observations. The following discussion is organized by first examining limitations attributable to the sample (i.e. random sample of park visitors and observed samples) and then by the limitations attributable to the data collection instrument. Issues of validity, reliability, and generalizability are examined.

Random Sample of Park Visitors

There are two primary concerns for the random sample of park visitors that may affect the external validity and thus the generalizability of the results to all PFNP visitors. First, the number of park visitors who were not willing to participate (24.6%) in the post-visit contact must be considered. And second, the number of park visitors who participated in the post-visit contact, but did not return a completed questionnaire (20.0%) should not be overlooked. When the number of park visitors who returned a completed questionnaire (365) is

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compared to the number asked to participate (603) in the study. Only 60.5% of the randomly selected park visitors were included in the questionnaire data set. While Babbie (1992) considers a response rate of 60% as good and 70% as very good, the randomly selected park visitors who did not participate in the post-visit contact or respond with a completed questionnaire may cause the results to be biased in some respects. Some examples of visitor groups that may have been under-represented in the study due to these biases are: (1) those who were not fluent in English; (2) those who did not understand what the ranger was asking; (3) those who were in a hurry; (4) those who were not interested in the park; and (5) those who came on tour buses. Therefore, when interpreting the results, one must be careful to consider the possibility of non-participant and non-respondent biases and their implications.

Another important concern is that sampling occurred only during the summer months and the late summers months (July and August) were over sampled (see page 47). Therefore, it may not be appropriate to generalize the study’s finding to all months of the year. Visitors who come during the summer months may differ significantly from those who visit during other months of the year. For example, the proportion of visitors traveling with school age children may be significantly higher in the summer than the balance of the year.

**Observed Samples**

The observed samples share many of the limitations with the random sample of park visitors. Specifically, the non-participant, non-
respondent and dates of observation biases are possible limitations for
the observed samples. A total of 226 visitors were observed, but only
116 (51.3%) returned a questionnaire. Babbie (1992) classifies a
response rate of "at least 50% as adequate for analysis and reporting."
The dates of observation were essentially limited to the months of May
and June, so we can only speak to theft and thieves during these months.
Other possible biases of the observed samples resulted from the
observation techniques and are discussed below.

**Thief Sample**

The thief sample has several internal validity threats. First, the
sample may have been biased by visitors who were discrete about
their petrified wood collecting behavior. Thieves who were concerned
about being caught may have been very "slick" in their collecting
behavior and thus gone undetected by the observers. This would result
in their being under-represented in the sample. Second, thefts
occurring near the parking lot were more likely to be observed than
those which occurred in the more remote areas of the site. Third,
visitors who liked to bend down and take a closer look at the petrified
wood, or pick up a piece of petrified wood and then at some later point
put it down, may have been incorrectly classified as a thief. We were
aware of this problem, and trained our observers not to be "fooled", but
it is possible that a few mistakes were made. Fourth, the observers may
have developed hunches over time on who were likely thieves and may have
watched these individuals more closely, while others at the site at the
time may have been "under-observed." For example, visitors with
European accents may have been watched more carefully by the observers than other visitors. Fifth, the observers who posed as a park visitor may have affected the behavior of visitors to the site.

Non-Thief Sample

As originally planned, the non-thief sample was to be a random sample of park visitors to the observation sites (i.e. Crystal Forest and Long Logs). However, several possible biases were introduced by the observers. First, a person who ended up spending more than about fifteen minutes at the site was often dropped as a possible non-thief observation. The longer that a person in the non-thief sample was on-site, the more likely an actual theft by some other visitor on site was observed. When such a theft occurred, the observer had to change his or her focus and could no longer track the non-thief. Second, people who did not bend down to examine petrified wood and instead just walked the trails were more likely to become part of the non-thief sample. Therefore, the visitors who had an interest in carefully looking at the petrified wood and exploring the landscape off the trail, but did not do any collecting may have been under-represented in the non-thief sample.

Survey Instrument Limitations

The survey instrument limitations revolved around how different measures of interest were operationalized. Specifically, several measures in the questionnaire required the respondent to perform somewhat complex cognitive activities. For example, question 14 involved the use of a scale to rank the seriousness of illegal behavior
and has a lengthy introduction and example. And question 16 gave a hypothetical situation and asked the respondent to answer questions based upon that situation.

The complexities of questions 14 and 16 were weighted against the information that could be obtained. Often, a complex question is skipped over or answered incorrectly (Babbie 1992). Therefore, a complex question could result in a high number of missing cases (e.g. question 14) or the responses may not be valid for the question asked due to the respondent misunderstanding the question (e.g. questions 14 and 16). These potential problems were balanced against the need for the information in gaining a fuller understanding of petrified wood theft.
CHAPTER FIVE: RESULTS AND DISCUSSION

Extent of Petrified Wood Theft

The extent of petrified wood theft was measured in two ways. Thefts per hour of observation and thefts per number of people visiting a site. Thefts per hour was determined by dividing the total number of thefts observed by the total number of hours of observation. Crystal Forest experienced 1.09 thefts per hour and Long Logs experienced 1.00 theft per hour. Over the course of the study for both Crystal Forest and Long Logs, an average of 1.02 thefts per hour was observed.

Thefts per number of people visiting the site was determined by dividing the total number of thefts observed by the number of people entering the site while it was under observation. At Crystal Forest, 1.17 percent of the people visiting the site were observed collecting petrified wood. At Long Logs, 1.32 percent of the people visiting the site were observed to be thieves. Combining the results for both sites, 1.22 percent of the people visiting the two sites were observed collecting petrified wood. Table 2 summarizes the extent of petrified wood theft findings.

63
Table 2. Extent of Petrified Wood Theft.

<table>
<thead>
<tr>
<th>Site</th>
<th>Thefts per Hour (N)</th>
<th>Thefts per Number of People Visiting Site (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystal Forest</td>
<td>1.09</td>
<td>1.17</td>
</tr>
<tr>
<td>Long Logs</td>
<td>1.00</td>
<td>1.31</td>
</tr>
<tr>
<td>Combined</td>
<td>1.02</td>
<td>1.22</td>
</tr>
</tbody>
</table>

Factor Analysis and Scale Reliability

In order to test the study hypotheses developed in chapter 2, latent variables for the three levels of moral reasoning (i.e. preconventional, conventional, and post-conventional), thoughtlessness, and collector traits had to be developed. Question 12 and question 15 from the mailback questionnaire (Appendix C) were designed to contain the necessary indicator variables to represent the latent variables used in hypothesis testing. However, factor analysis and reliability analysis were required to validate the hypothesized factor structure.

Question 12 (collector traits) was designed to measure the following four collector constructs: impulsiveness, authenticity, symbolic memories, and social meanings. The impulsiveness construct was designed to identify the collector trait that indicates attitude accessibility is a problem. That is, the sudden urge or compulsion to possess a piece of petrified wood may temporarily obscure or render nonsalient recently received messages against collecting. The authenticity construct was designed to identify the trait of true collectors. A true collector would be considered an individual who
expends a great deal of time and effort to seek out items that are genuine. The symbolic memories construct was designed to identify the trait of collecting objects for the purpose of symbolizing memories of times and people. Collected objects represent an extension of personal memory and meanings. The social meanings construct was designed to identify the trait of collecting objects to display one's accomplishments and travels to others.

People make moral decisions on how to behave using different levels of moral reasoning depending on a variety of contextual factors. Question 15 (level of moral reasoning) was designed to measure three level of moral reasoning constructs: preconventional moral reasoning, conventional moral reasoning, and post-conventional moral reasoning. These constructs were fully developed and explained in chapter 2 under the subtitle "moral reasoning literature review."

**Question 12 - Collector Traits**

The Principal-Components Analysis (PC) extracted four factors with eigenvalues greater than one. These four factors explained 63.2 percent of the variance among the items. A varimax rotation was performed to enhance the interpretability of the factors by minimizing the number of variables that have high loadings on a factor (Norusis 1988). This resulted in the following factor loading characteristics: Factor 1 included items that had a general collecting theme; Factor 2 included items that related to impulsive collecting behavior; Factor 3 included items related to photography; and Factor 4 consisted of only one item
and it referred to not buying items from gift shops because they are artificial. Table 3 summarizes the collector traits factor statistics.

Only Factor 2 confirmed an anticipated theoretical construct, impulsiveness (Table 5). Factor 1 contained items from all four of the theoretical constructs. Upon examining the items included in Factor 1, collecting objects appeared to be the underlying theme (Table 4). Factor 3 contained an item from the symbolic memories and social meanings constructs. Photography was the common element in these two items. Factor 4 contained only one item; it was represented from the authenticity construct. Tables 4 and 5 summarize the factor loadings for Factor 1 and Factor 2, respectively. Factor 1 is important in testing the first hypothesis, and Factor 2 is important in testing the third hypothesis. Factor 3 and Factor 4 loadings are summarized in Table 6 and Table 7, respectively.

Table 3. Factor Analysis Statistics for Collector Traits.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Eigenvalue</th>
<th>Percent of Variance</th>
<th>Cumulative Percent of Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5.91518</td>
<td>37.0</td>
<td>37.0</td>
</tr>
<tr>
<td>2</td>
<td>1.73218</td>
<td>10.8</td>
<td>47.8</td>
</tr>
<tr>
<td>3</td>
<td>1.38301</td>
<td>8.6</td>
<td>56.4</td>
</tr>
<tr>
<td>4</td>
<td>1.08430</td>
<td>6.8</td>
<td>63.2</td>
</tr>
</tbody>
</table>
### Table 4. Factor 1 (Collector) Loadings.

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>I like to keep objects that remind me of special places I have been.</td>
<td>0.81495</td>
</tr>
<tr>
<td>When I visit a place, I try to collect a keepsake that captures the meaning of that place.</td>
<td>0.80327</td>
</tr>
<tr>
<td>I like to return from my trip with a unique souvenir.</td>
<td>0.75169</td>
</tr>
<tr>
<td>I like to collect souvenirs of my visits so I can remember my travels better.</td>
<td>0.74632</td>
</tr>
<tr>
<td>When I travel I carefully search for authentic objects that truly represent the places I have visited.</td>
<td>0.73854</td>
</tr>
<tr>
<td>When I find curious or unusual objects on trips, I like to collect them.</td>
<td>0.66120</td>
</tr>
<tr>
<td>I like to relive experiences through the objects I collect when I travel.</td>
<td>0.65977</td>
</tr>
</tbody>
</table>

### Table 5. Factor 2 (Impulsiveness) Loadings.

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>When something I see catches my fancy, I often feel an irresistible urge to collect it.</td>
<td>0.79393</td>
</tr>
<tr>
<td>When an object catches my eye, I often experience an immediate desire to possess it even though I have no real use for it.</td>
<td>0.78134</td>
</tr>
</tbody>
</table>
Table 6. Factor 3 (Photography) Loadings.

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>I take photographs mostly to help me remember the places I visit.</td>
<td>0.73897</td>
</tr>
<tr>
<td>An important reason for taking photographs of the places I visit is so I can tell others about my trip.</td>
<td>0.85715</td>
</tr>
</tbody>
</table>

Table 7. Factor 4 (Gift Shop Things Seem Artificial) Loading.

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>I usually don't buy things in gift shops because they seem so artificial.</td>
<td>0.93394</td>
</tr>
</tbody>
</table>

Reliability Analysis

Reliability analysis was performed on the items in Factor 1 (Collector) and Factor 2 (Impulsiveness). Cronbach’s Alpha for the Collector scale was 0.88, and 0.80 for the Impulsiveness scale (Table 8). Knoke and Bohrnstedt (1994) state that a Cronbach’s Alpha of 0.60 is barely acceptable and 0.70 and above is desirable. Therefore, the Collector and the Impulsiveness scales appear to have highly acceptable reliability.
Table 8. Cronbach’s Alpha for the Collector and Impulsiveness Scales.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector Scale (Factor 1)</td>
<td>0.88</td>
</tr>
<tr>
<td>Impulsiveness Scale (Factor 2)</td>
<td>0.80</td>
</tr>
</tbody>
</table>

**Question 15 - Level of Moral Reasoning**

The Principal-Components Analysis (PC) extracted three factors with eigenvalues greater than one. These three factors explained 64.6 percent of the variance among the items. A varimax rotation was performed to enhance the interpretability of the factors by minimizing the number of variables that have high loadings on a factor (Norusis 1988). This resulted in the following factor loading characteristics: Factor 1 included items from the hypothesized post-conventional level of moral reasoning construct; Factor 2 included items from the conventional level of moral reasoning construct; and Factor 3 included items from the preconventional level of moral reasoning construct. Table 9 summarizes the factor statistics.
Each of the factors tended to confirm the hypothesized structure of the moral reasoning construct. Factor 1 (Post-Conventional) included all of the items designed to capture this level of moral reasoning. Factor loadings varied from a high of 0.87 to a low of 0.65 (Table 10). Factor 2 (Conventional) included all of the items designed to capture this level of moral reasoning. Factor loadings varied from a high of 0.80 to a low of 0.50 (Table 11). The item with the low factor loading, "Other people that I care about wouldn't like me to take petrified wood," seemed to be at the cross over between the conventional and preconventional level of moral reasoning. Factor 3 (Preconventional) included the two items designed to capture this level of moral reasoning (Table 12). Factor loading for both items were above 0.80.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Eigenvalue</th>
<th>Percent of Variance</th>
<th>Cumulative Percent of Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.34073</td>
<td>33.4</td>
<td>33.4</td>
</tr>
<tr>
<td>2</td>
<td>1.92560</td>
<td>19.3</td>
<td>52.7</td>
</tr>
<tr>
<td>3</td>
<td>1.19282</td>
<td>11.9</td>
<td>64.6</td>
</tr>
</tbody>
</table>
Table 10. Factor 1 (Post-Conventional Moral Reasoning) Loadings.

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>I want petrified wood to be there for future generations.</td>
<td>0.87328</td>
</tr>
<tr>
<td>I want to leave the petrified wood there for others to enjoy.</td>
<td>0.84278</td>
</tr>
<tr>
<td>I want national parks to be preserved in their most pristine condition.</td>
<td>0.78674</td>
</tr>
<tr>
<td>I want to leave the petrified wood there for my family and friends to enjoy.</td>
<td>0.64873</td>
</tr>
</tbody>
</table>

Table 11. Factor 2 (Conventional Moral Reasoning) Loadings.

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>I want to set a good example for others.</td>
<td>0.80932</td>
</tr>
<tr>
<td>I want to follow park rules.</td>
<td>0.79350</td>
</tr>
<tr>
<td>My religious beliefs prevent me from taking a piece of petrified wood.</td>
<td>0.61251</td>
</tr>
<tr>
<td>Other people that I care about wouldn't like me to take petrified wood.</td>
<td>0.49730</td>
</tr>
</tbody>
</table>

Table 12. Factor 3 (Preconventional Moral Reasoning) Loadings.

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>I fear I will be caught by a park ranger.</td>
<td>0.86246</td>
</tr>
<tr>
<td>I don't want to be caught and fined for taking a piece of petrified wood.</td>
<td>0.81742</td>
</tr>
</tbody>
</table>
Reliability Analysis

Reliability analysis was performed on the three level of moral reasoning factors (Table 13). Cronbach’s Alpha for the three factors varied from a fully adequate 0.79 for the items in Factor 1 (Post-Conventional) to a barely acceptable 0.63 for the items in Factor 2 (Conventional) and 0.66 for the items in Factor 3 (Preconventional).

Table 13. Cronbach’s Alpha for the Level of Moral Reasoning Scales.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-Conventional Scale (Factor 1)</td>
<td>0.79</td>
</tr>
<tr>
<td>Conventional Scale (Factor 2)</td>
<td>0.63</td>
</tr>
<tr>
<td>Preconvention Scale (Factor 3)</td>
<td>0.66</td>
</tr>
</tbody>
</table>

Cluster Analysis for Moral Reasoning

To identify two relatively homogeneous groups of individuals based on their level of moral reasoning characteristics, a cluster analysis was performed. This was done to facilitate testing hypotheses two through six, which compare individuals who score high on the preconventional level of moral reasoning measure to individuals who score low on the same measure. Specifically, two clusters were specified to group individuals according to their scores on the Preconventional, Conventional, and Post-Conventional scales developed from the above factor analysis. Two clusters were chosen because when
a greater number of clusters were requested, it was noted that the greatest understanding would come from two clusters. The resulting number of cases in each cluster was about equally divided with 219 cases in Cluster 1 and 234 cases in Cluster 2. Upon examining the final cluster centers, three significant differences were noted. Cluster 1 has significantly higher scores for all three level of moral reasoning scales than Cluster 2. At first it may appear that the individuals in Cluster 1 just have a greater motivation not to take petrified wood or tend to answer with higher ratings on the moral reasoning scales than the individuals in Cluster 2. However, the greatest difference occurs at the preconventional level. The three level of moral reasoning scores had a possible range from 1.00 (not at all important) to 5.00 (extremely important). The Preconventional center for Cluster 1 is 3.54 compared to 1.57 for Cluster 2 (F = 929.19 and p < 0.001); the Conventional center for Cluster 1 is 3.70 compared to 2.93 for Cluster 2 (F = 109.76 and p < 0.001); and the Post-Conventional center for Cluster 1 is 4.59 compared to 4.47 for Cluster 2 (F = 5.55 and p = 0.019). The Preconventional level of moral reasoning is the number one characteristic that differentiates between the two clusters. Therefore, individuals assigned to Cluster 1 are classified as scoring "high" at the preconventional level of moral reasoning and individuals assigned to Cluster 2 are classified as scoring "low" at the preconventional level of moral reasoning. Table 14 summarizes the results from the cluster analysis. and Table 15 summarizes the ANOVA results of the cluster differences.

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Number of Cases (N)</th>
<th>Preconventional</th>
<th>Final Cluster Centers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Conventional</td>
</tr>
<tr>
<td>1</td>
<td>219</td>
<td>3.54</td>
<td>3.70</td>
</tr>
<tr>
<td>2</td>
<td>234</td>
<td>1.57</td>
<td>2.93</td>
</tr>
</tbody>
</table>

Table 15. ANOVA for Cluster Differences for Levels of Moral Reasoning.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cluster MS</th>
<th>DF</th>
<th>Error MS</th>
<th>DF</th>
<th>F</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preconventional</td>
<td>439.2899</td>
<td>1</td>
<td>0.4728</td>
<td>451</td>
<td>929.1945</td>
<td>0.000</td>
</tr>
<tr>
<td>Conventional</td>
<td>67.6688</td>
<td>1</td>
<td>0.6165</td>
<td>451</td>
<td>109.7592</td>
<td>0.000</td>
</tr>
<tr>
<td>Post-Conventional</td>
<td>1.7581</td>
<td>1</td>
<td>0.3168</td>
<td>451</td>
<td>5.5491</td>
<td>0.019</td>
</tr>
</tbody>
</table>

Hypothesis Testing

It is important to note from a strict scientific point of view the research hypotheses developed in chapter 2 are alternative hypotheses (i.e. statements of expected relationships between variables) and cannot be statistically tested. Only null hypotheses (i.e. statements that no relationship exists between variables) can be tested statistically. Therefore, accepting an alternative hypothesis (research hypothesis) has to be viewed as conditional. Social relationships can only be assessed indirectly through the rejection of null hypotheses. Accepting a research hypothesis is more correctly understood to be rejecting the null hypothesis. Likewise, rejecting a research hypothesis is more
correctly understood to be failing to reject the null hypothesis. However, for clarity of understanding, the research hypotheses that follow are stated as either being accepted (i.e. rejecting the null hypothesis) or rejected (i.e. failing to reject the null hypothesis) (Knoke and Bohnstedt 1994).

**Thoughtlessness**

| H1: Thieves will be more thoughtless than non-thieves. |

The first research hypothesis was tested by comparing the Impulsiveness scale mean scores for thieves and non-thieves. A one-tailed t-test was used to test for a difference, since the research hypothesis predicts the thieves will be more thoughtless. The mean thoughtlessness score for the thieves is 2.34 and 1.86 for the non-thieves. The possible range of these scores is 1.00 to 5.00. The difference between the two scores was in the direction predicted and was significant (p = 0.002). Therefore, the first research hypothesis is accepted (i.e. the null hypothesis is rejected) indicating that thieves are more thoughtless as measured by an impulsiveness to collect scale. Table 16 summarizes the results from the t-test.
Table 16. T-test for a Difference in Thoughtlessness Between Thieves and Non-Thieves.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number of Cases</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>t-Value</th>
<th>DF</th>
<th>1-tail Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thieves</td>
<td>48</td>
<td>2.35</td>
<td>0.863</td>
<td>3.02</td>
<td>99</td>
<td>0.002</td>
</tr>
<tr>
<td>Non-thieves</td>
<td>53</td>
<td>1.86</td>
<td>0.787</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Collecting

H2: Park visitors who score high on the preconventional moral reasoning measure relating to petrified wood theft will have a greater likelihood to collect a piece of petrified wood than park visitors who score low on the same measure.

The second research hypothesis was tested by comparing mean scores of Cluster 1 (High Preconventional) and Cluster 2 (Low Preconventional) for the indicator variable "I don't want petrified wood". The lower the score, the more an individual would want a piece of petrified wood. A one-tailed t-test was used to test for a difference, since the direction of the difference was hypothesized. The mean score for Cluster 1 (High Preconventional) was 2.54 and 1.97 for Cluster 2 (Low Preconventional). The difference between the two scores was significant (p < 0.001), however it was not in the direction predicted. Therefore, the second research hypothesis is rejected (i.e. the null hypothesis is not rejected). Table 17 is a summary of the t-test results.
Table 17. T-test for a Difference in Desire to Collect Petrified Wood Between the High and Low Preconventional Moral Reasoning Groups.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number of Cases</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>t-Value</th>
<th>DF</th>
<th>1-tail Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Precon.</td>
<td>215</td>
<td>2.54</td>
<td>1.462</td>
<td>4.51</td>
<td>401</td>
<td>0.999</td>
</tr>
<tr>
<td>Low Precon.</td>
<td>231</td>
<td>1.97</td>
<td>1.155</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**H3:** Park visitors who score high on the preconventional moral reasoning measure relating to petrified wood theft will have a higher propensity to be collectors than park visitors who score low on the same measure.

The third research hypothesis was tested by comparing individuals in Cluster 1 (High Preconventional) to those in Cluster 2 (Low Preconventional). A one-tailed t-test was used to test for a difference. Because the hypothesis predicts that individuals scoring high on the preconventional measures will score higher on a collecting measure than those individuals who scored low on the preconventional measure. The mean Collector score (from the factor analysis of the collecting traits items above) for Cluster 1 (High Preconventional) was 3.42 and 3.23 for Cluster 2 (Low Preconventional). Table 18 indicates that the difference between the two groups was in the direction predicted and was significant \( p = 0.007 \). Therefore, the second research hypothesis is accepted (i.e. the null hypothesis is rejected) indicating that individuals who scored high on the Preconventional moral
reasoning measure are more likely to be collectors as measured by the Collector Scale.

Table 18. T-test for a Difference in Propensity to be a Collector Between the High and Low Preconventional Moral Reasoning Groups.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number of Cases</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>t-Value</th>
<th>DF</th>
<th>1-tail Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Precon.</td>
<td>207</td>
<td>3.42</td>
<td>0.811</td>
<td>2.46</td>
<td>429</td>
<td>0.007</td>
</tr>
<tr>
<td>Low Precon.</td>
<td>224</td>
<td>3.23</td>
<td>0.812</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Attitudes**

**H4:** Park visitors who score high on the preconventional moral reasoning measure relating to petrified wood theft will agree less with statements regarding the proper treatment of petrified wood than park visitors who score low on the same measure.

Six different petrified wood attitude measures were used to test this research hypothesis. The mean attitude scores for individuals in Cluster 1 (High Preconventional) were compared to those in Cluster 2 (Low Preconventional) for each of six attitude measures. A one-tailed t-test was used to test for a difference, since the hypothesis predicts that individuals in Cluster 1 will agree more with positively phrased items (e.g. It is all right to climb or sit on logs of petrified wood) and agree less with negatively phrased items (e.g. It is wrong to pick up petrified wood, even if you put it back where you found it). Table 19
through Table 24 contain the results of the t-tests for these six attitude measures.

Five of the six attitude measures were significant at the 0.10 level in the direction hypothesized, and three of the six attitude measures were significant at the 0.05 level in the direction hypothesized. **Therefore the fourth research hypothesis is accepted (i.e. the null hypothesis is rejected) indicating that there are attitude differences between the High Preconventional cluster and the Low Preconventional cluster.**

Table 19. T-test for a Difference in the Attitude Measure. "It is wrong to pick up petrified wood, even if you put it back where you found it." Between the High and Low Preconventional Moral Reasoning Groups.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number of Cases</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>t-Value</th>
<th>DF</th>
<th>1-tail Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Precon.</td>
<td>215</td>
<td>3.13</td>
<td>1.289</td>
<td>-2.63</td>
<td>445</td>
<td>0.005</td>
</tr>
<tr>
<td>Low Precon.</td>
<td>232</td>
<td>3.44</td>
<td>1.240</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 20. T-test for a Difference in the Attitude Measure. "Taking petrified wood reduces the beauty of the park." Between the High and Low Preconventional Moral Reasoning Groups.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number of Cases</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>t-Value</th>
<th>DF</th>
<th>1-tail Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Precon.</td>
<td>217</td>
<td>4.50</td>
<td>0.688</td>
<td>-0.70</td>
<td>444</td>
<td>0.243</td>
</tr>
<tr>
<td>Low Precon.</td>
<td>229</td>
<td>4.55</td>
<td>0.631</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 21. T-test for a Difference in the Attitude Measure. "It is all right to pick up petrified wood as long as you leave it in the park." Between the High and Low Preconventional Moral Reasoning Groups.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number of Cases</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>t-Value</th>
<th>DF</th>
<th>1-tail Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Precon.</td>
<td>217</td>
<td>2.54</td>
<td>1.209</td>
<td>1.30</td>
<td>447</td>
<td>0.100</td>
</tr>
<tr>
<td>Low Precon.</td>
<td>232</td>
<td>2.39</td>
<td>1.179</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 22. T-test for a Difference in the Attitude Measure. "It is all right to take a piece of petrified wood from the park as long as it is a small piece." Between the High and Low Preconventional Moral Reasoning Groups.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number of Cases</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>t-Value</th>
<th>DF</th>
<th>1-tail Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Precon.</td>
<td>216</td>
<td>1.80</td>
<td>1.127</td>
<td>2.83</td>
<td>405</td>
<td>0.003</td>
</tr>
<tr>
<td>Low Precon.</td>
<td>232</td>
<td>1.53</td>
<td>0.872</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 23. T-test for a Difference in the Attitude Measure. "It is all right to collect ordinary rocks while visiting the park." Between the High and Low Preconventional Moral Reasoning Groups.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number of Cases</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>t-Value</th>
<th>DF</th>
<th>1-tail Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Precon.</td>
<td>210</td>
<td>2.08</td>
<td>1.009</td>
<td>2.07</td>
<td>413</td>
<td>0.020</td>
</tr>
<tr>
<td>Low Precon.</td>
<td>226</td>
<td>1.89</td>
<td>0.865</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 24. T-test for a Difference in the Attitude Measure. "It is all right to climb or sit on logs of petrified wood." Between the High and Low Preconventional Moral Reasoning Groups.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number of Cases</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>t-Value</th>
<th>DF</th>
<th>1-tail Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Precon.</td>
<td>215</td>
<td>2.46</td>
<td>1.179</td>
<td>1.37</td>
<td>444</td>
<td>0.086</td>
</tr>
<tr>
<td>Low Precon.</td>
<td>231</td>
<td>2.32</td>
<td>1.051</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Threat of Punishment**

**H5:** Park visitors who score high on the preconventional moral reasoning measure will spend more time at petrified wood sites with a low threat of punishment than park visitors who score low on the same measure.

This research hypothesis was tested by comparing the mean amount of time spent by individuals in the High Preconventional cluster to individuals in the Low Preconventional cluster at the low threat of punishment sites (i.e. Blue Mesa, Jasper Forest, Crystal Forest, and Long Logs). A one-tailed t-test was used since the direction of the difference was hypothesized. Table 23 through Table 26 contain the results of the t-tests. There were no significant differences between the two groups. Therefore, the fifth research hypothesis is rejected (i.e. the null hypothesis is not rejected) indicating that there is not a difference in the amount of time spent at low threat of punishment sites between the High Preconventional group and the Low Preconventional group.
Table 25. T-test for a Difference in the Amount of Time Spent at Blue Mesa Between the High and Low Preconventional Moral Reasoning Groups.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number of Cases</th>
<th>Mean (Minutes)</th>
<th>Standard Deviation</th>
<th>t-Value</th>
<th>DF</th>
<th>1-tail Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Precon.</td>
<td>196</td>
<td>7.47</td>
<td>11.463</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Precon.</td>
<td>212</td>
<td>6.67</td>
<td>9.873</td>
<td>0.75</td>
<td>386</td>
<td>0.226</td>
</tr>
</tbody>
</table>

Table 26. T-test for a Difference in the Amount of Time Spent at Jasper Forest Between the High and Low Preconventional Moral Reasoning Groups.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number of Cases</th>
<th>Mean (Minutes)</th>
<th>Standard Deviation</th>
<th>t-Value</th>
<th>DF</th>
<th>1-tail Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Precon.</td>
<td>218</td>
<td>5.86</td>
<td>8.673</td>
<td>0.14</td>
<td>416</td>
<td>0.446</td>
</tr>
<tr>
<td>Low Precon.</td>
<td>234</td>
<td>5.76</td>
<td>6.965</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 27. T-test for a Difference in the Amount of Time Spent at Crystal Forest Between the High and Low Preconventional Moral Reasoning Groups.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number of Cases</th>
<th>Mean (Minutes)</th>
<th>Standard Deviation</th>
<th>t-Value</th>
<th>DF</th>
<th>1-tail Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Precon.</td>
<td>218</td>
<td>9.18</td>
<td>11.661</td>
<td>-0.64</td>
<td>445</td>
<td>0.739</td>
</tr>
<tr>
<td>Low Precon.</td>
<td>234</td>
<td>9.95</td>
<td>13.975</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 28. T-test for a Difference in the Amount of Time Spent at Long Logs Between the High and Low Preconventional Moral Reasoning Groups.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number of Cases</th>
<th>Mean (Minutes)</th>
<th>Standard Deviation</th>
<th>t-Value</th>
<th>DF</th>
<th>1-tail Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Precon.</td>
<td>218</td>
<td>10.67</td>
<td>12.743</td>
<td>0.76</td>
<td>450</td>
<td>0.225</td>
</tr>
<tr>
<td>Low Precon.</td>
<td>234</td>
<td>9.73</td>
<td>13.839</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

H6: Park visitors who score high on the preconventional moral reasoning measure will spend less time at petrified wood sites with a high threat of punishment than park visitors who score low on the same measure.

This research hypothesis was tested by comparing the mean amount of time spent at the high threat of punishment site (i.e. Giant Logs) by individuals in the High Preconventional cluster to individuals in the Low Preconventional cluster. A one-tailed t-test was used since the direction of the difference was hypothesized. Table 29 contains the results of the t-test. There were no significant differences between the two groups. Therefore, the sixth research hypothesis is rejected (i.e. the null hypothesis is not rejected) indicating that there is not a difference in the amount of time spent at low threat of punishment sites between the High Preconventional group and the Low Preconventional group.

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**Table 29. T-test for a Difference in the Amount of Time Spent at Giant Logs Between the High and Low Preconventional Moral Reasoning Groups.**

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number of Cases</th>
<th>Mean (Minutes)</th>
<th>Standard Deviation</th>
<th>t-Value</th>
<th>DF</th>
<th>1-tail Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Precon.</td>
<td>218</td>
<td>7.55</td>
<td>12.012</td>
<td>0.77</td>
<td>450</td>
<td>0.223</td>
</tr>
<tr>
<td>Low Precon.</td>
<td>234</td>
<td>6.71</td>
<td>11.227</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Thieves Versus Non-Thieves Level of Moral Reasoning**

H7: Thieves will score higher on preconventional moral reasoning measures relating to petrified wood theft than non-thieves.

This research hypothesis was tested by comparing the mean preconventional moral reasoning scores of thieves and non-thieves. A one-tailed t-test was used since the direction of the difference was hypothesized. Table 30 contains the t-test results. The mean score of the thief group was 2.96 and was 2.23 for the non-thief group. The difference was in the hypothesized direction and it was significant (p = 0.001). Therefore, the seventh research hypothesis is accepted (i.e. the null hypothesis is rejected) indicating that thieves are more concerned with a threat of punishment as a reason not to collect petrified wood than non-thieves.
Table 30. T-test for a Difference in the Preconventional Level of Moral Reasoning Between Thieves and Non-Thieves.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number of Cases</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>t-Value</th>
<th>DF</th>
<th>1-tail Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thief</td>
<td>49</td>
<td>2.96</td>
<td>1.245</td>
<td>3.15</td>
<td>99</td>
<td>0.001</td>
</tr>
<tr>
<td>Non-Thief</td>
<td>52</td>
<td>2.23</td>
<td>1.078</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

H8: Thieves will score lower on the conventional moral reasoning measures relating to petrified wood theft than non-thieves.

This research hypothesis was tested by comparing the mean conventional moral reasoning scores of thieves and non-thieves. A one-tailed t-test was used since the direction of the difference was hypothesized. Table 31 contains the t-test results. The mean score of the thief group was 3.30 and was 3.37 for the non-thief group. The difference was in the hypothesized direction, however it was not significant. Therefore, the eighth research hypothesis is rejected (i.e. the null hypothesis is not rejected).

Table 31. T-test for a Difference in the Conventional Level of Moral Reasoning Between Thieves and Non-Thieves.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number of Cases</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>t-Value</th>
<th>DF</th>
<th>1-tail Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thief</td>
<td>49</td>
<td>3.30</td>
<td>0.810</td>
<td>-0.39</td>
<td>100</td>
<td>0.347</td>
</tr>
<tr>
<td>Non-Thief</td>
<td>53</td>
<td>3.37</td>
<td>0.894</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

85
H9: Thieves will score lower on the post-conventional moral reasoning measures relating to petrified wood theft than non-thieves.

This research hypothesis was tested by comparing the mean post-conventional moral reasoning scores of thieves and non-thieves. A one-tailed t-test was used since the direction of the difference was hypothesized. Table 32 contains the t-test results. The mean score of the thief group was 4.50 and was 4.56 for the non-thief group. The difference was in the hypothesized direction, however it was not significant. Therefore, the ninth research hypothesis is rejected (i.e. the null hypothesis is not rejected).

Table 32. T-test for a Difference in the Post-Conventional Level of Moral Reasoning Between Thieves and Non-Thieves.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number of Cases</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>t-Value</th>
<th>DF</th>
<th>1-tail Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thief</td>
<td>50</td>
<td>4.50</td>
<td>0.511</td>
<td>-0.54</td>
<td>102</td>
<td>0.296</td>
</tr>
<tr>
<td>Non-Thief</td>
<td>54</td>
<td>4.56</td>
<td>0.627</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CHAPTER SIX: IMPLICATIONS

This chapter contains a discussion of the implications of the results. It is divided into two main sections, park management implications and research implications.

Park Management Implications

Extent of Theft

The extent of theft measured during this study (1.02 Thefts per Hour and 1.22% of People Visiting Site (see Table 2)) indicates that casual theft of petrified wood by park visitors is a serious problem, as park managers had suspected. The 1.02 average thefts per hour observed at Crystal Forest and Long Logs should be regarded as a conservative figure, since it was nearly impossible to have seen every theft that occurred on a site while it was under observation. Therefore, if one considers just the number of hours the park was open during June, 1993 (30 days x 13 hours per day = 390 hours) and multiplies that by 1.02 thefts per hour at the two sites observed, approximately 800 (390 hours x 1.02 thefts per hour x 2 sites = 795 thefts) thefts would have occurred. Then factor in that the average number of pieces taken by the

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thieves was observed to be 1.6 for the two sites. Over 1200 (795 thefts \times 1.6 \text{ pieces per theft} = 1272) pieces of petrified wood would have been removed from Long Logs and Crystal Forest in June 1993. When one considers this amount of theft over the course of a year, and then over the course of a decade it adds up to a staggering amount of petrified wood taken by people who would not ordinarily be considered criminals.

Now to enhance the picture of the amount of petrified wood theft, consider that 1.22 percent all of people visiting a site were observed collecting petrified wood. Again this is a conservative figure, since not every theft could be observed. For this discussion assume that the average thief removes petrified wood from only one site during his or her park visit and that this "rate of theft" remains constant through the year. The park's visitation is estimated to be at over 800,000 individuals per year (USDI 1993). If 1.22 percent of the people who visit the park each year collected petrified wood from the park, that would result in almost 10,000 thefts per year. Then consider that 1.6 pieces of petrified wood are taken per theft incident on average. That would mean that somewhere around 16,000 pieces of petrified wood may be removed from the park each year. And this number appears to be a very low estimate when compared to a study conducted by Monkevich (1994). This study documented the loss of petrified wood by physically measuring the change in the amount of petrified wood in sample plots over a year. Measurements were made at five high use areas (Blue Mesa, Crystal Forest, Giant Logs, Jasper Forest, and Long Logs). The amount of petrified wood at these five sites was found to have declined by over
289,000 pieces in one year (all this loss may not be attributed entirely to theft. some may result from changes due to wind or rain erosion).

Therefore, the park’s General Management Plan’s (USDI 1993) assertion that petrified wood theft by park visitors is the park’s number one resource protection problem seems justified. Then one must ask the question: how can park managers effectively and efficiently control the amount of petrified wood theft while allowing for the use and enjoyment of the park?” To begin to answer this question, it is now time to explore what answers the results from the moral reasoning perspective on petrified wood theft may hold.

Understanding Petrified Wood Theft from a Moral Reasoning Perspective

The visitors who were observed collecting petrified wood were found to be more thoughtless than those who did not collect petrified wood. The thoughtlessness variable was operationalized by measures that contained an impulsiveness theme. Therefore, in part, some thieves may require some additional “priming” (e.g. persuasive signs, site design (e.g. a low fence or rail along the trail to remind visitors to stay on the trail), and park rangers) so that they access the proper attitude while in the park. While more persuasive signs and better site designs aimed at priming the desired attitudes may be appropriate, increasing the presence of highly visible park rangers at the petrified wood sites may perhaps be the best route to prime the proper attitude. And if the proper attitude can not be primed, the threat of punishment would be equally as valuable.
From the theory of attitude accessibility, it was noted that both repeated expression and direct experience were important in accessing an attitude (Vicent and Fazio 1992). Therefore, repeated expression of the desired attitude by means of persuasive signs, site design and park rangers would be in order. However, when examining the findings of the study, it must be noted that when subjects filled out the questionnaire, possibly at home or at least away from the park, they had a very proper attitude as defined by the park. In responding to the statement, "I want petrified wood to be there for future generations," 96.7 percent of the thieves rated this as a very or extremely important reason for not taking petrified wood. Similarly, 96.7 percent of the thieves also rated the statement, "I want national parks to be preserved in their most pristine condition," as being a very or extremely important reason for not collecting petrified wood. And 85.0 percent of the thieves disagreed or strongly disagreed with the statement, "It is all right to take a piece of petrified wood from the park as long as it is a small piece." So, it appears that a majority of the thieves had a proper attitude toward the park and petrified wood when in the context of filling out a questionnaire. However, it appears that the thieves' behavior did not follow the attitudes accessed by the questionnaire.

This may have been because they did not perceive that removing petrified wood would do any harm to the park. However, 91.7 percent agreed or strongly agreed to the statement, "Taking petrified wood reduces the beauty of the park." Clearly the thieves' behavior did not follow their attitudes that were accessed by the questionnaire. The question of what was the thieves' attitude while at the park remains
unanswered. Did they rationalize the behavior to themselves while at
the park? Did they succumb to social pressures to take a piece of
petrified wood or were they just thoughtless actions? These are very
difficult questions to address in a mailback questionnaire. If the
behavior was in fact thoughtless, more cues (e.g. persuasive signs, site
design, and park rangers) at the petrified wood sites would be the
answer to part of the petrified wood theft problem.

Signs may not be as effective an intervention program as having
more rangers at the petrified wood sites, since thieves differ most
markedly from non-thieves in their concern about being punished for
collecting petrified wood. By examining the results of the level of
moral reasoning hypotheses, one can see that thieves did not differ
significantly from non-thieves when it came to conventional and post-
conventional reasons why not to collect petrified wood.

To explore the possible effectiveness of increasing the threat of
punishment, consider that the thieves scored higher on the
preconventional moral reasoning measures than the non-thieves.
Therefore, the thieves were more concerned with a threat punishment as a
reason not to collect petrified wood than non-thieves. Fully 50.0
percent of thieves rated being caught and fined for taking a piece of
petrified wood as a very or extremely important reason for not doing so.
In comparison, only 25.4 percent of the non-thieves rated the same item
as very or extremely important. Consequently, increasing the threat of
punishment or the severity of the punishment has been empirically
justified and perhaps may be the most important element in a program to
limit the amount of petrified wood theft. Persuasive signs and site
design may help in accessing a park visitor's proper attitude while in the park. However the effectiveness of these cues may be overshadowed by the effectiveness of having a park ranger on site. Anecdotally, during the observation of Crystal Forest and Long Logs, no thefts were recorded when a ranger was present. While this finding was not part of this study's research design, it may be important to note for future research designs that incorporate such a treatment.

Having a park ranger on site does not have to equal a visitor's freedom being limited. If properly trained, a park ranger may be able to increase a visitor's freedom by helping him or her more fully understand what he or she is experiencing and to gain a greater respect for the same.

Research Implications

The Model of Understanding Noncompliant Behavior (Figure 2) was valuable in understanding petrified theft. It allowed several theories (i.e. theory of reasoned action, theory of planned behavior, theory of attitude accessibility, and the four component model of morality) that have been used in the past to understand outdoor recreation and other behaviors to be integrated for a more complete understanding of behavior. However, the scope of this study was too limited to begin to validate all of the model's components, linkages, and flows. Therefore, the model remains a very theoretical abstraction that helped to understand petrified wood theft, but very little empirical evidence has been brought to bear on the total model.

However, this study did attempt to validate parts on the total model. Specifically, how one's level of moral reasoning related to
attitudes, collecting values and traits, and avoidance of punishment were investigated. Several relationships theorized by the model were empirically validated: (1) the relationship between the preconventional level of moral reasoning items and attitudes was found to be significant; (2) the relationship between the preconventional level of moral reasoning and a personality trait (i.e. collecting trait) was found to be significant; and (3) the relationship between behavior and a personality trait (i.e. impulsive collecting trait) was found to be significant.

At this point, the model may be most valuable in providing a sound theoretical structure for understanding noncompliant behavior. From examining the model, it is possible to understand how various factors may interact in determining behavior. Therefore when an intervention program is designed, it is possible to see how different aspects of the intervention program may work together to accomplish its goal. Given the model's value in understanding noncompliant behavior, it is necessary to consider its central component, moral reasoning, more carefully.

The factor analysis for the moral reasoning items indicated that the items were useful in identifying the three levels of moral reasoning, which can be used to more effectively target different types of intervention programs to reduce petrified wood theft. There are several more implications that apply to possible future research. Moral reasoning items along with thoughtless and personal values (not measured in this study) items could be used to understand behaviors and choices in leisure and non-leisure settings. For example, backcountry users
could be asked why they would or would not follow low impact camping methods. Theories of moral reasoning and items to measure its dimensions might serve as a foundation to assess other possible moral orientations, such as an earth ethic. Similarly, the moral reasoning construct could serve as a basis for understanding why a person manages his or her own land in a certain way. Moral reasoning research seems to have many possible applications in understanding, planning, and managing outdoor recreation sites and natural resources in general, however, very little research has been done in this area to date.
CHAPTER SEVEN: SUMMARY AND CONCLUSIONS

Controlling petrified wood theft by park visitors has always been a challenge for Petrified Forest National Park (PFNP) managers. Over the years they have tried numerous intervention programs with less than satisfactory results. Lacking a systematic study of the amount and nature of petrified wood theft and the characteristics of the visitors who take petrified wood, park managers have had to rely on their intuitive assessment of the situation in designing intervention programs. Therefore, the objectives of this study were to estimate the extent of petrified wood theft at two popular petrified wood sites and describe the characteristics of visitors who collected petrified wood from a moral reasoning perspective.

A Model of Noncompliant Behavior (Figure 2) was developed to inform the petrified wood theft problem. The model was set in the context of an outdoor recreation experience, which recognizes that people require freedom in their recreational experience to fulfill a unique set of needs. The model melded together the theory of reasoned
action, the theory of planned behavior, the theory of attitude accessibility, and the four component model of morality.

The theory of reasoned action provided an understanding of how one evaluates outcomes, assesses the probability of outcomes, forms attitudes, reacts to social motivations, and then develops an intention to act, which can help in predicting behavior. However, sometimes intentions have been found to have a low predictive ability for behavior. Therefore, the theory of planned behavior and the theory of attitude accessibility were incorporated to understand why this may be so.

The theory of planned behavior added perceived behavioral control to account for an individual's past experience, anticipated impediments and obstacles to performing a behavior. The theory of attitude accessibility added the idea of thoughtless behavior, and that different individual's attitudes may or may not be accessed depending on a multitude of possible cues and past experiences.

These three theories (i.e. theory of reasoned action, theory of planned behavior, and the theory of attitude accessibility) were seen as operating within the first component (interpreting the situation) of the four-component model of morality. In addition to interpreting the situation, the four-component model of morality helps in understanding how moral judgments are made, how moral and personal values interact, and how a person's ability to follow through with an intention is important in understanding behavior.

To understand moral development, Kohlberg and Gilligan's (Kohlberg 1976, 1984, 1986, and Gilligan 1982) theories were combined to form
three levels of moral development: preconventional, conventional, and post-conventional. The preconventional level was characterized as focusing on the self to maximize pleasure and minimize pain. The conventional level was characterized as being concerned about the welfare of others by considering the importance of social expectations, the rights of others, accepting the current social order, and pleasing others. The post-conventional level was characterized as going beyond the rules of society to determine what is just, fair, and caring for others by placing oneself in the other's position.

The study consisted of one main study population, all PFNP visitors, and two observed sub-populations, thieves and non-thieves. Data on length of stay at park features, travel patterns, socio-demographic characteristics, importance of souvenir collecting, attitudes pertaining to appropriate behavior in national parks, and levels of moral reasoning were collected using a post-visit contact and a mailback questionnaire for all three populations. The apparent socio-demographic characteristics, behavior, and situational variables were recorded for the observed sub-populations in addition to the post-visit contact and mailback questionnaire information.

At total of 1.22 percent of the people visiting the two petrified wood sites (i.e. Crystal Forest and Long Logs) were observed collecting petrified wood, and approximately 1.02 thefts were recorded per hour of observation. An average of 1.6 pieces of petrified wood was taken per theft incidence. By extrapolating these finding, an estimated 14,000 to
16,000 pieces of petrified wood are removed from the two observed petrified wood sites per year. This rate of theft justifies park managers identifying petrified wood theft by park visitors as the number one resource protection problem the park faces.

The thieves were found to be more thoughtless than the non-thieves, indicating that more cues to prime the desired attitude may help reduce petrified wood theft. When responding to the questionnaire, possibly at home or at least away from the park, thieves' and non-thieves' attitudes toward the park and petrified wood were very similar. Both the thieves and non-thieves rated wanting petrified wood to be there for future generations and preserving the pristine nature of the park as very or extremely important reason for not collecting petrified wood. And over 85 percent of both thieves and non-thieves disagreed or strongly disagreed that it is all right to take a small piece of petrified wood. However, thieves were found to be significantly more concerned than non-thieves with a threat of punishment as a reason not to collect petrified wood.

In summary, strategically placed cues, such as persuasive signs, thoughtful site designs, and an increased presence of uniformed park rangers throughout the park, should help park visitors to access the desired attitudes that will prevent petrified wood theft. While signs with conventional and post-conventional moral content will likely help to reduce petrified wood theft, signs with preconventional messages (e.g. petrified wood theft is prohibited - you may be fined up to $500
for collecting petrified wood, and collecting petrified wood is illegal - violators will be prosecuted. $500 minimum fine) are probably more important in stopping theft. However, conventional (e.g. It is against park rules to collect petrified wood please help spread the message) and post-conventional (e.g. please leave the petrified wood in the park for future generations) signs may be quite valuable in changing long term attitudes that may not have immediate results, but through repeated exposure, visitors will be less likely to collect from a national park in the future. The preconventional signs threatening punishment should be backed-up with some tangible punishment source (i.e. a park ranger). However, the park ranger's primary focus should not be to apprehend and punish a visitor after the theft occurs, but should be to act as a deterrent that is available to help interpret the site for the visitors. The primary emphasis for a ranger thus should be to help people understand the landscape they are experiencing and develop a greater respect for it.

Simply watching visitors from a hidden location and "pouncing" on them as they collect a piece of petrified wood should be an unacceptable method of enforcing the rules about collecting petrified wood. However, being highly visible and accessible to park visitors, a ranger may actually free visitors of the possible guilt from having impulsively collected a piece of petrified wood from a national park. Such a theft would likely violate their attitudes as measured by the questionnaire. Therefore, a ranger's worth should not be determined by the number of visitors he or she apprehended for collecting petrified wood, rather the number of visitors who he or she helped refrain from collecting
petrified wood. This would likely result in a greater respect for national parks and national park rangers in general, rather than some form of resentment for the same that may last a lifetime. In the end, preventing theft by priming the proper attitude is much more valuable than watching theft occur, punishing the thief, and possibly breeding resentment for the National Park Service and more importantly the park lands.
LITERATURE CITED


Dustin, D.L. 1985. To feed or not to feed the bears: The moral choices we make. Parks and Recreation, 10:54-57, 72.


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APPENDIX A
POST-VISIT INTERVIEW FORMS
## North Exit Contact Sheet

1993 Petrified Forest National Park Visitor Survey

<table>
<thead>
<tr>
<th>Exit Information</th>
</tr>
</thead>
</table>
| Date: ___________   
| Time: ___________   
| AM / PM   
| Contact #: ___________   
| Number of people in group: ___________   
| Vehicle Type: ___________   |

<table>
<thead>
<tr>
<th>Entry Information</th>
</tr>
</thead>
</table>
| Date: ___________   
| Time: ___________   
| AM / PM   
| Location:   
| ( ) North (I-40)   
| ( ) South (U.S. 180) |

1. Approximately how much time did you spend at the following areas?  
   *Please enter the number of minutes you spent at EACH area.*

   1. Gift Shop / Snack Bar (near South Entrance)   ________  
   2. Rainbow Forest Museum   ________  
   3. Giant Logs Trail (behind Museum)   ________  
   4. Long Logs   ________  
   5. Crystal Forest   ________  
   6. Jasper Forest   ________  
   7. Agate Bridge   ________  
   8. Blue Mesa Nature Trail   ________  
   9. Blue Mesa Scenic Loop   ________  
   10. Newspaper Rock   ________  
   11. Puerco Indian Ruins   ________  
   12. Painted Desert Inn   ________  

2. Approximately how much time do you plan to spend at the following areas?  
   *Please enter the number of minutes you plan to spend at EACH area.*

   13. Painted Desert Visitor Center   ________  
   14. Painted Desert Gift Shop   ________  
   15. Painted Desert Restaurant   ________  

3. Please print your name and home address.

   Name: ____________________________  
   Street Address: ____________________________  
   City: ____________________________  
   State: ____________________________  
   Zip Code: ____________________________  

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South Exit Contact Sheet
1993 Petrified Forest National Park Visitor Survey

Exit Information
Date: ___________ Time: ___________ AM / PM Contact #: ___________
Number of people in group: ___________ Vehicle Type: ___________

Entry Information
Date: ___________ Time: ___________ AM / PM Location: ( ) North (I-40) ( ) South (U.S. 180)

1. Approximately how much time did you spend at the following areas? Please enter the number of minutes you spent at EACH area.

1. Painted Desert Visitor Center ___________
2. Painted Desert Gift Shop ___________
3. Painted Desert Restaurant ___________
4. Painted Desert Inn ___________
5. Puerco Indian Ruin ___________
6. Newspaper Rock ___________
7. Blue Mesa Scenic Loop ___________
8. Blue Mesa Nature Trail ___________
9. Agate Bridge ___________
10. Jasper Forest ___________
11. Crystal Forest ___________
12. Long Logs ___________
13. Rainbow Forest Museum ___________
14. Giant Logs Trail (behind Museum) ___________
15. Gift Shop / Snack Bar (near South Entrance) ___________

2. Please print your name and home address.
   Name ____________________________________________
   Street Address __________________________________
   City ___________ State ___________ Zip Code ________
APPENDIX B
FIRST COVER LETTER
Dear Petrified Forest National Park Visitor:

We appreciate your participation in this study. From the Painted Desert to the Rainbow Forest, Petrified Forest National Park contains many important geological and archeological sites. The National Park Service is responsible for both protecting these unique resources and providing visitors with a high quality experience. This responsibility often presents complex management challenges. Understanding the park visitor is a critical element in meeting these challenges.

The following questions refer to your recent visit to Petrified Forest National Park. Please take the time to carefully fill out the questionnaire so that our results can be truly representative of all park visitors. When you have finished, please send the questionnaire back to us in the self-addressed, postage-paid envelope as soon as possible. While your participation is voluntary, and you are not required to respond, your cooperation is very important in making the survey results comprehensive, accurate, and timely.

This questionnaire has an identification number for mailing purposes only. Your responses will be held in strictest confidence. All results will be analyzed in such a way that your answers on any single question cannot be identified with you.

Thank you for your cooperation.

Sincerely,

Joseph W. Roggenbuck
Associate Professor of
Forest Recreation

Dennis Stratton
Research Assistant
APPENDIX C
MAIL-BACK QUESTIONNAIRE
Petrified Forest National Park
Visitor Survey 1993

Virginia Tech
Department of Forestry
Virginia Polytechnic Institute and State University
Blacksburg, VA

Western Regional Office
National Park Service
San Francisco, CA
1. How would you describe the group you were with when you visited Petrified Forest National Park? Please check one.

( ) Alone—If alone, go to Question 3.
( ) Family only
( ) Friends only
( ) Friends and family
( ) Tour group
( ) Other organized group (e.g. school or church group, Scouts, etc.)
( ) Other, please describe: __________________________________________

2. Please tell us the number of people in your group and the number of group members in each age category listed below.

____ Total number of people in your group

Were you traveling with any:

Preschoolers (less than 5 years old)?
( ) No
( ) Yes—if yes, how many? ______

Children (5 to 12 years old)?
( ) No
( ) Yes—if yes, how many? ______

Teenagers (13 to 19 years old)?
( ) No
( ) Yes—if yes, how many? ______

Anyone over 62 years old?
( ) No
( ) Yes—if yes, how many? ______

3. How many times have you visited Petrified Forest National Park, including this visit?

____ Total number of visits

4. Was Petrified Forest National Park your primary destination on this trip away from home?

( ) Yes
( ) No—if no, what other park and outdoor attractions have you visited in the four-corners region (NM, AZ, CO, UT) on this trip? __________________________________________
__________________________________________
__________________________________________

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5a. People learn about the story of Petrified Forest National Park from different sources while at the park. Which of the following park information sources did you use? Please circle all that apply.

1. Official Petrified Forest National Park brochure/map
2. Official Petrified Forest National Park newspaper
3. Painted Desert Visitor Center exhibits
4. Painted Desert Inn exhibits
5. Rainbow Forest Museum exhibits
6. Rangers at points of interest (overlooks, archeological sites, geological sites, etc.)
7. Ranger-led walks
8. Ranger talks

9. Films or slide shows
10. Self-guided walks
11. Interpretive signs
12. Entrance station information
13. Other, please specify:

5b. Which of the above information sources was most helpful in learning the Petrified Forest National Park story? Write the number corresponding to the most helpful source.

_______ Most helpful

6a. People learn about the park's rules and regulations from many sources while at the park. Which of the following park information sources helped you learn about the park's rules and regulations? Please circle all that apply.

1. Official Petrified Forest National Park brochure/map
2. Official Petrified Forest National Park newspaper
3. Painted Desert Visitor Center exhibits
4. Painted Desert Inn exhibits
5. Rainbow Forest Museum exhibits
6. Rangers at points of interest (overlooks, archeological sites, geological sites, etc.)
7. Ranger-led walks
8. Ranger talks

9. Films or slide shows
10. Self-guided walks
11. Interpretive signs
12. Entrance station information
13. Other, please specify:

6b. Which of the above information sources was most helpful in learning the park's rules and regulations? Write the number corresponding to the most helpful source.

_______ Most helpful
7. Did you receive any information about the park before arriving?
   ( ) No
   ( ) Yes—If yes, from what source(s)? Please check all that apply.
   ( ) Magazine
   ( ) Book
   ( ) Travel guide
   ( ) Highway map or sign
   ( ) Tourist brochure
   ( ) Auto club
   ( ) Friends/Relatives
   ( ) Wrote/Called park for information
   ( ) Other, please specify: ________________________________

8. Approximately how much time did you spend at the following areas?
   Please enter the number of minutes you spent at EACH area.

   Minutes
   _____ Painted Desert Visitor Center
   _____ Painted Desert Gift Shop
   _____ Painted Desert Restaurant

9a. On this trip to Petrified Forest National Park, did you purchase any items from either of the two gift shops (Painted Desert Gift Shop or the Rainbow Forest Gift Shop) in the park? Do not include any items purchased from shops outside the park.
   ( ) No
   ( ) Yes—If yes, please tell us how much you spent on the following items.

   $_____ Clothing (T-shirts, hats, etc.)
   $_____ Native American jewelry
   $_____ Petrified wood
   $_____ Books, magazines, travel guides, etc.
   $_____ Film
   $_____ Glassware
   $_____ Other, please specify: ________________________________

9b. On this trip to Petrified Forest National Park, did you purchase any petrified wood from souvenir or rock shops outside of the Park?
   ( ) No
   ( ) Yes
10. To what extent did you find each of the following to be a problem during your visit to Petrified Forest National Park? Please circle the appropriate number.

<table>
<thead>
<tr>
<th>Issue</th>
<th>Not at all</th>
<th>Slight</th>
<th>Moderate</th>
<th>Serious</th>
<th>Very Serious</th>
</tr>
</thead>
<tbody>
<tr>
<td>Litter along the road</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Litter along the trails</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Vandalism</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Not enough law enforcement rangers</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Inadequate visitor center information</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Poorly maintained trails</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Not enough hiking trails</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Petrified wood for sale in the park</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>People collecting petrified wood</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Too many people at the Painted Desert Visitor Center (northern I-40 end)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Too many people at the Rainbow Forest Museum (southern end)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Waiting at the entry/exit station</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Too many people on petrified wood nature trails</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Not enough signs to help understand the park features</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Not enough rangers to answer questions about the park</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Too many people hiking off the trails</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Developed areas too close to major natural features</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Too many rock shops just outside the south entrance station</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Not enough wheelchair accessible trails</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Not enough interpretive/nature trails</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Your Feelings About National Parks

11. We would like to have an understanding of your general feelings about national parks. Please circle the number that best describes how much you agree or disagree with EACH of the following statements.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I get greater satisfaction out of visiting national parks than other vacation destinations.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I find a lot of my life is organized around national park use.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>One of the major reasons I now live where I do is that it has opportunities for visiting national parks.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I seldom take the time to visit national parks.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Visiting national parks is one of the most satisfying things I do.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>National parks play a central role in my lifestyle.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Your Feelings About Vacation Souvenirs

12. The following statements relate to your interest in vacation souvenirs. The statements may seem similar to each other, so please read each one carefully and respond to each one as honestly as you can. Please circle the appropriate number.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I like to collect souvenirs of my visits so I can remember my travels better.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Objects I collect during my travels impress my friends.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>When I visit a place, I try to collect a keepsake that captures the meaning of that place.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>When I find curious or unusual objects on trips, I like to collect them.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I collect items when I travel to let people know more about me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I usually don't buy things in gift shops because they seem too artificial.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I take photographs mostly to help me remember the places I visit.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>When an object catches my eye, I often experience an immediate desire to possess it even though I have no real use for it.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>When I travel, I carefully search for authentic objects that truly represent the places I have visited.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I like to collect souvenirs from my travels to show others about the places I visited.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I like to keep objects that remind me of special places I have been.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>When I visit places on vacation, I often pick up knickknacks that grab my imagination.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I like to return from my travels with some unique souvenirs.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I like to relive experiences through the objects I collect when I travel.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>An important reason for taking photographs of the places I visit is so I can tell others about my trip.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>When something I see catches my fancy, I often feel an irresistible urge to collect it.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
### Attitudes About Park Behavior

13. We would like to know your feelings on some general park issues. Please circle the number that best describes how much you agree or disagree with EACH of the following statements.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is all right to pick wildflowers in a national park.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>It is wrong to walk off trails when trails are provided.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>It is all right to walk off the trail to get a closer look at Indian rock art.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>It is wrong to pick up petrified wood, even if you put it back where you found it.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Seeing souvenirs made out of petrified wood in the park gift shops encourages people to collect a piece of petrified wood from the park.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Taking petrified wood reduces the beauty of the park.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I don't think I could tell a piece of petrified wood from an ordinary rock.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>It is all right to collect fossils from a national park.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Being able to buy petrified wood in the park gift shop reduces the temptation to take a piece from park grounds.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>It is wrong to sell petrified wood in the park, even though it does not come from the park.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>It is all right to enter prehistoric Indian pueblo and pit house ruins in national parks.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>It is all right to pick up petrified wood as long as you leave it in the park.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>It is wrong to remove Indian arrowheads from the park.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>It is all right to take a piece of petrified wood from the park as long as it is a small piece.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Seeing polished petrified wood in the visitor center encourages people to collect a piece from the park grounds.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>It is all right to collect ordinary rocks while visiting the park.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>It is all right to hike/climb to the top of the buttes or ridges near the park's petrified wood areas.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>It is all right to climb or sit on logs of petrified wood.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
14. Park visitors differ in their opinions on what actions are acceptable in national parks. Below, we have listed 11 things that visitors might do in a park. Each action is different, and each might be considered an unacceptable or problem behavior. We would like to know your feelings on the degree of seriousness of the actions. Rate the seriousness of the actions in relation to each other—not in relation to other possible problem behaviors that might occur.

If you believe the behavior would not be a problem—it would be acceptable in the park—assign it to 0. However, you do not have to assign a behavior to 0; nor do you have to assign the most serious problem behavior to 100. Be sure to assign a letter representing each behavior to a unit on the scale. This is not a test. The important thing is how you feel about each behavior.

### HUNTING EXAMPLE

The following example of a hunter's evaluation of the seriousness of four behaviors on a 100-point scale should help you understand your task.

<table>
<thead>
<tr>
<th>D</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>60</td>
<td>70</td>
<td>80</td>
</tr>
<tr>
<td>Not a problem</td>
<td>Extremely serious problem</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Hunter Behaviors:**

A. Hunting on private land without landowner's permission
B. Shooting from a road
C. Carrying a loaded gun in a motor vehicle
D. Carrying a gun that is not in a case or not broken down in a motor vehicle

**REMEMBER:** We are interested in the seriousness, not the frequency, of park visitor actions. Please assign the letter representing EACH action to its appropriate place on the scale.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>70</td>
<td>80</td>
<td>90</td>
</tr>
<tr>
<td>Not a problem</td>
<td>Extremely serious problem</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Park Visitor Actions:**

A. Purposefully harming an endangered plant or animal
B. Travelling 55 miles per hour in a 45 miles per hour speed zone in the park
C. Defacing Indian rock art in the park
D. Picking wildflowers in the park
E. Taking one small piece of petrified wood from the park
F. Littering in the park
G. Removing prehistoric Indian pottery, or pieces of pottery, from the park
H. Purposefully harming a prairie dog
I. Taking a handful of petrified wood from the park
J. Collecting Indian arrowheads in the park
K. Feeding wildlife in the park
15. We are interested in what are the most important reasons visitors have for not taking petrified wood from the park. Please tell us how important each of the following reasons were in influencing you not to take petrified wood from the park. Please circle the appropriate number.

<table>
<thead>
<tr>
<th>Reason</th>
<th>Not at all</th>
<th>Somewhat</th>
<th>Moderately</th>
<th>Very</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>I want petrified wood to be there for future generations.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I fear I will be caught by a park ranger.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I want national parks to be preserved in their most pristine condition.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Other people that I care about wouldn't like me to take petrified wood.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I want to follow park rules.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I want to set a good example for others.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I don't want petrified wood.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I don't want to be caught and fined for taking a piece of petrified wood.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I want to leave the petrified wood there for others to enjoy.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>My religious beliefs prevent me from taking a piece of petrified wood.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I want to leave the petrified wood there for my family and friends to enjoy.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
16. If a scientific study determined that an unacceptable level of park resources were being damaged or removed from the park, how would you feel about each of the following management actions? Please circle the number that shows how much you support or oppose EACH action.

<table>
<thead>
<tr>
<th>Action</th>
<th>Strongly Oppose</th>
<th>Oppose</th>
<th>Neutral</th>
<th>Support</th>
<th>Strongly Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide more aggressive enforcement of park rules and regulations.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Require people to stay on the paved paths.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Have more signs telling people what the rules are.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Put up fences around important park resources.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Put up a low railing along foot trails.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Put up more signs that help educate visitors on the rules and the reasons behind them.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Have more rangers patrol the sites that are experiencing high levels of resource damage and/or theft.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Provide more information in the visitor center on the rules and why it is important to follow them.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Allow only ranger-guided walks in petrified wood areas.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Prohibit visitors from picking up petrified wood.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Build boardwalks with railings to keep people on the trails.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Search vehicles as they leave the park.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Increase the penalties for damaging and/or stealing park resources.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Provide park visitors with more information on appropriate park behavior.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Ban the sale of petrified wood in the park.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Some Information About You

17. Your age? _____ Years

18. Gender?
   ( ) Male
   ( ) Female

19. What is the highest educational level you have attained? Please circle the highest grade completed.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17+</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Primary School</td>
<td>High School</td>
<td>College</td>
<td>Graduate Work</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

20. Which of the following income levels best describes your total household income before taxes?

   ( ) Less than $13,000
   ( ) $13,000 to $24,999
   ( ) $25,000 to $39,999
   ( ) $40,000 to $59,999
   ( ) $60,000 to $99,999
   ( ) More than $100,000

21. What is your ethnic origin?

   ( ) Native American
   ( ) Asian or Pacific Islander
   ( ) Black
   ( ) White
   ( ) Hispanic
   ( ) Other

22. Are you currently married?

   ( ) Yes
   ( ) No

23. Do you have children under 5 years old living with you?

   ( ) Yes
   ( ) No

24. Do you have children between 5 and 17 years old living with you?

   ( ) Yes
   ( ) No

25. What is your present employment status?

   ( ) Employed outside the home
   ( ) Unemployed
   ( ) Retired
   ( ) Full-time homemaker
   ( ) Student
Thank you for your time and effort. We appreciate your willingness to respond to our questionnaire and welcome any comments you wish to make. We have provided space below for your convenience.

16 U.S.C. 1a-7 authorizes collection of this information. This information will be used by park managers to better serve the public. Response to this request is voluntary. No action may be taken against you for refusing to supply the information requested. Your name is requested for follow-up mailing purposes only. When analysis of the questionnaire is completed, all name and address files will be destroyed. Thus, the permanent data will be anonymous. Please do not put your name or that of any member of your group on the questionnaire. Data collected through visitor surveys may be disclosed to the Department of Justice when relevant to litigation or anticipated litigation, or to appropriate Federal, State, local, or foreign agencies responsible for investigating or prosecuting a violation of law.

Public reporting burden for this form is estimated to average 20 minutes per response. Direct comments regarding the burden estimate or any other aspect of this form to the Information Collection Clearance Officer, National Park Service, P.O. Box 37127, Washington, D.C. 20014-7127; and to the Office of Management and Budget, Paperwork Reduction Project 1024-0091, Washington, D.C. 20503.
APPENDIX D
POST CARD REMINDER
Dear Petrified Forest National Park Visitor,

We recently contacted you requesting your participation in the 1993 Petrified Forest National Park General Visitor Survey. If you have already completed and returned the questionnaire to us, please accept our sincere thanks. If not, we would appreciate you doing so as soon as possible. The survey has been given to only a small number of Petrified Forest National Park Visitors. If the results are to accurately represent the opinions of all park visitors, it is extremely important that your opinions be included in the study.

Thank you for contributing to this important project.

Sincerely,

Joseph W. Roggenbuck  
Associate Professor of  
Forest Recreation

Dennis W. Stratton  
Research Assistant
APPENDIX E
SECOND COVER LETTER
During your recent visit to Petrified Forest National Park, we contacted you and asked you to complete a survey on park management issues. You were one of a few visitors randomly selected for this study, therefore your participation in it is essential if the results are to be useful in guiding future decisions about the use and protection of the park. This study is an opportunity to express your personal experiences and feelings as a visitor. If the results are to accurately represent the opinions of all park visitors, it is extremely important that your opinions be included in the study.

As of today, we still have not received your completed questionnaire. If you have already completed and returned the questionnaire to us, please accept our sincere thanks. If not, we would appreciate you doing so as soon as possible. If you would like to know what other users think, please print your name and address on the back of the return envelope.

Sincerely,

Dr. Joseph W. Roggenbuck
Associate Professor, Forestry
APPENDIX F
THIEF OBSERVATION CODING FORM
**Observation Check Sheet**

- **Date:** ________  
- **Your Name:** ________  
- **Tagger:** ________

- **Time:** ________  
  - **[Caller's Name : ]**

**PERSON**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age</th>
<th>Clothing</th>
<th>Language</th>
<th>Race</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>10s</td>
<td>T-shirt</td>
<td>Ger / Scan</td>
<td>White</td>
<td>Facial H ________</td>
</tr>
<tr>
<td>Female</td>
<td>20s</td>
<td>Button D</td>
<td>French</td>
<td>Black</td>
<td>Hair lgth ________</td>
</tr>
<tr>
<td>Don't Know</td>
<td>30s</td>
<td>Halter/B</td>
<td>Italian</td>
<td>Hispanic</td>
<td>Col ________</td>
</tr>
<tr>
<td></td>
<td>40s</td>
<td>Col ________</td>
<td>Spanish / Port</td>
<td>Asian / P</td>
<td>________</td>
</tr>
<tr>
<td></td>
<td>50s</td>
<td>Other: Lg / Sh</td>
<td>Oriental</td>
<td>Native</td>
<td>Accessories ________</td>
</tr>
</tbody>
</table>

**Bottoms**

- 60s Lg / Sh / Skt English Other Size/wt ________
- 70s Col Other Don't Know Other ________

**Hat**

- Don't Know

**Des:** ________

**Don't Know**

**VEHICLE**

<table>
<thead>
<tr>
<th>Color</th>
<th>Type</th>
<th>Doors</th>
<th>Size</th>
<th>Frt. Plate</th>
<th>Passengers</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>Sed / HB</td>
<td>2</td>
<td>Small</td>
<td>Yes / No</td>
<td>1</td>
<td>Front: ________</td>
</tr>
<tr>
<td>Orange</td>
<td>Wagon</td>
<td>3</td>
<td>Medium</td>
<td>Co:_______</td>
<td>2</td>
<td>________</td>
</tr>
<tr>
<td>Yellow</td>
<td>P-U</td>
<td>4</td>
<td>Large</td>
<td>State:______</td>
<td>3+</td>
<td>Top: ________</td>
</tr>
<tr>
<td>Green</td>
<td>Jeep / Ut</td>
<td>5</td>
<td></td>
<td>Tag:_______</td>
<td></td>
<td>________</td>
</tr>
<tr>
<td>Blue</td>
<td>Van</td>
<td></td>
<td></td>
<td>Other:_______</td>
<td></td>
<td>________</td>
</tr>
<tr>
<td>Violet</td>
<td>MiniVan</td>
<td></td>
<td></td>
<td>Other:_______</td>
<td></td>
<td>________</td>
</tr>
<tr>
<td>Brown</td>
<td>VW-Van</td>
<td></td>
<td></td>
<td>Rear Tag: ________</td>
<td></td>
<td>________</td>
</tr>
<tr>
<td>Gray</td>
<td>Van - RV</td>
<td></td>
<td></td>
<td></td>
<td>Body:_______</td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>Trk - RV</td>
<td></td>
<td></td>
<td></td>
<td>________</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>MotorH</td>
<td></td>
<td></td>
<td>Make: ________</td>
<td></td>
<td>________</td>
</tr>
<tr>
<td>Light</td>
<td></td>
<td></td>
<td></td>
<td>Rental: ________</td>
<td></td>
<td>________</td>
</tr>
<tr>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
<td>Y / N</td>
<td></td>
<td>________</td>
</tr>
<tr>
<td>Dark</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>________</td>
</tr>
<tr>
<td>Bright</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>________</td>
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<tr>
<td>Metallic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>________</td>
</tr>
</tbody>
</table>
THEFT INFORMATION

What were they doing: Looking at log
Searching
Photo
Walking
Other:

Did they look around before: Yes / No / Don’t Know

Number of pieces taken: __________ / Don’t Know

Where did they put it:
Pocket
Hand
Hand bag
Bag - Type:
Fanny Pack
Back Pack
Carry Bag
Don’t Know
Other:

Did they look around after: Yes / No / Don’t Know

Did they talk about it: Yes / No / Don’t Know

How did the others respond: ________________________

Discomfort?: Yes / No / Not evident

What did they do next:
Hurried back to car
Other:

No. of other people (not in their group) visible nearby:
0 / Just me / 1 - 5 / 6 - 10 / > 10

Distance from other group: __________ ft

Location of theft (X)
Location of other groups (O)
Location of me (*)

Group Info
<table>
<thead>
<tr>
<th>Age</th>
<th>Gender</th>
<th>Age</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M / F</td>
<td></td>
<td>M / F</td>
</tr>
<tr>
<td></td>
<td>M / F</td>
<td></td>
<td>M / F</td>
</tr>
<tr>
<td></td>
<td>M / F</td>
<td></td>
<td>M / F</td>
</tr>
<tr>
<td></td>
<td>M / F</td>
<td></td>
<td>M / F</td>
</tr>
</tbody>
</table>
APPENDIX G
NON-THEIF OBSERVATION CODING FORM
**Observation Check Sheet**

Date: _______  Your Name: ____________ Tagger _________

Time: _______  [Caller's Name: _______]

**PERSON**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age</th>
<th>Clothing</th>
<th>Language</th>
<th>Race</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>'10s</td>
<td>T-shirt</td>
<td>Ger / Scan</td>
<td>White</td>
<td>Facial H______</td>
</tr>
<tr>
<td>Female</td>
<td>20s</td>
<td>Button D</td>
<td>French</td>
<td>Black</td>
<td>Hair lgth_____</td>
</tr>
<tr>
<td>Don't Know</td>
<td>30s</td>
<td>Halter/B</td>
<td>Italian</td>
<td>Hispanic</td>
<td>Col _________</td>
</tr>
<tr>
<td></td>
<td>40s</td>
<td>Col _____</td>
<td>Span / Port</td>
<td>Asian / P</td>
<td></td>
</tr>
<tr>
<td></td>
<td>50s</td>
<td>Other:____</td>
<td>Oriental</td>
<td>Native</td>
<td>Accessories____</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lg / Sh</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Bottoms**

<table>
<thead>
<tr>
<th>Age</th>
<th>Clothing</th>
<th>Language</th>
<th>Other</th>
<th>Size/wt</th>
</tr>
</thead>
<tbody>
<tr>
<td>60s</td>
<td>Lg / Sh / Skt</td>
<td>English</td>
<td>Other</td>
<td>Size/wt_______</td>
</tr>
<tr>
<td>70s</td>
<td>Lg / Sh / Skt</td>
<td>Other</td>
<td>Don't Know</td>
<td>Other_______</td>
</tr>
</tbody>
</table>

**Hat**

Don't Know  
Y / N  
Don't Know

Des: _____

**VEHICLE**

<table>
<thead>
<tr>
<th>Color</th>
<th>Type</th>
<th>Doors</th>
<th>Size</th>
<th>Front Plate</th>
<th>Passengers</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>Sed / HB</td>
<td>2</td>
<td>Small</td>
<td>Yes / No</td>
<td>1</td>
<td>Front:_________</td>
</tr>
<tr>
<td>Orange</td>
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<td>3</td>
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<td>P-U</td>
<td>4</td>
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<td>3+</td>
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<td>Jeep / Ut</td>
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<td>Tag:_______</td>
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<tr>
<td>Blue</td>
<td>Van</td>
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<td>Other:_______</td>
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<tr>
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<td>VW-Van</td>
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<td>Rear Tag:</td>
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<tr>
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<td>Van - RV</td>
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<tr>
<td>Black</td>
<td>Trk - RV</td>
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<td>Make:_______</td>
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<tr>
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<td>Rental:</td>
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<td>Model:</td>
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<tr>
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</table>
**Non-Terror Coding Form**

**Date:**

**Time:**

Your name:

What were they doing most of the time?

(Check all categories)

- Looking at
- Searching
- Photos - wood
- Photos - group
- Photos - view
- Walk - stroll
- Walk - hiking

No. of others within sight (most of the time):

- B/n Park Lot & Ramada
- Trail to Agate
- On rest of Trail
- Near observer

**Group Info [Include tagged person *]**

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<th>Race</th>
<th>Age</th>
<th>Gender</th>
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</tbody>
</table>


![Diagram]

- Parking Lot
- To Park Road
- Again House
VITA

Dennis Wayne Stratton was born in Battle Creek, Michigan on May 18, 1962. He graduated from DeVry Institute of Technology in Columbus, Ohio in 1985 with a Bachelor of Science degree in Electronics Engineering Technology. He was then employed four years by the Rockwell International Corporation in both New Hampshire and California as a field engineer working with the United States Navy on submarine navigation systems. He graduated from Michigan Technological University in Houghton, Michigan in 1992 with a Bachelor of Science degree in Forestry. While attending Michigan Technological University, he worked three seasons for the Ottawa National Forest in Michigan as a Wilderness Ranger in the McCormick and Sturgeon River Gorge wilderness areas. Since 1992, he has been enrolled as a graduate student in Virginia Polytechnic Institute and State University's forestry department. His course-work has emphasized park and protected area planning and management.

Dennis Wayne Stratton