A Perfect Pothunting Day

An Examination of Vandalism to the Cultural Resources of Canyon de Chelly National Monument, its Motivations, and Potential Solutions

by

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(Reference number 059019146 – Intake February 2007)

Submitted for the degree of
Master of Arts, Archaeology and Heritage
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January 30, 2009

CONTENTS

LIST OF FIGURES

All photographs courtesy of NPS, unless otherwise noted.

LIST OF TABLES

ACKNOWLEDGEMENTS

First and foremost, I would like to thank Dr. Ruth Young for her guidance and insight during the completion of this dissertation. I thank Scott E. Travis, former Superintendent, and Tom O. Clark, current Superintendent, and all of my colleagues at Canyon de Chelly National Monument for their support during my graduate education. I want to show gratitude to my fiancé, Keith for being supportive through some tough times, and for always believing in me. Finally, I'd like to thank my Mom and Dad for always encouraging me to follow my dreams, and for making them possible. Although I lost them both during this process, I know they have been with me in spirit, and that they are both very proud.

The sand is hard and one can easily drive a two wheel drive vehicle the length of the canyons so long as one stays in the ruts. Yet Canyon de Chelly National Monument has no one patrolling nor is anyone checking the entrance of the canyon. A perfect pothunting day – even the Navajos are for the most part out of the canyon.

- David DeHarport, 1962

CHAPTER I

INTRODUCTION

In the United States, federal land managers such as the National Park Service (NPS) are mandated by legislation such as the Antiquities Act (1906), the National Historic Preservation Act (1966, amended 1976), the National Environmental Policy Act (1969) and the Archaeological Resources Protection Act (1979) to identify, manage and protect cultural resources for future generations. These resources are irreplaceable and provide a tangible link to the past for the scholars that study them, the cultures that are connected to them, and the interested layperson.

At Canyon de Chelly National Monument, in the Four Corners Region of the U.S. Southwest (Figure 1), cultural resources are endangered by natural and human-caused agents. These agents of resource destruction are outlined in Figure 2; the focus of this study is the damage caused by agents that are predatory and malicious in nature, such as defacement and looting, or illegal activity such as visitation. This study will aim to determine the amount of damage that has occurred to the cultural

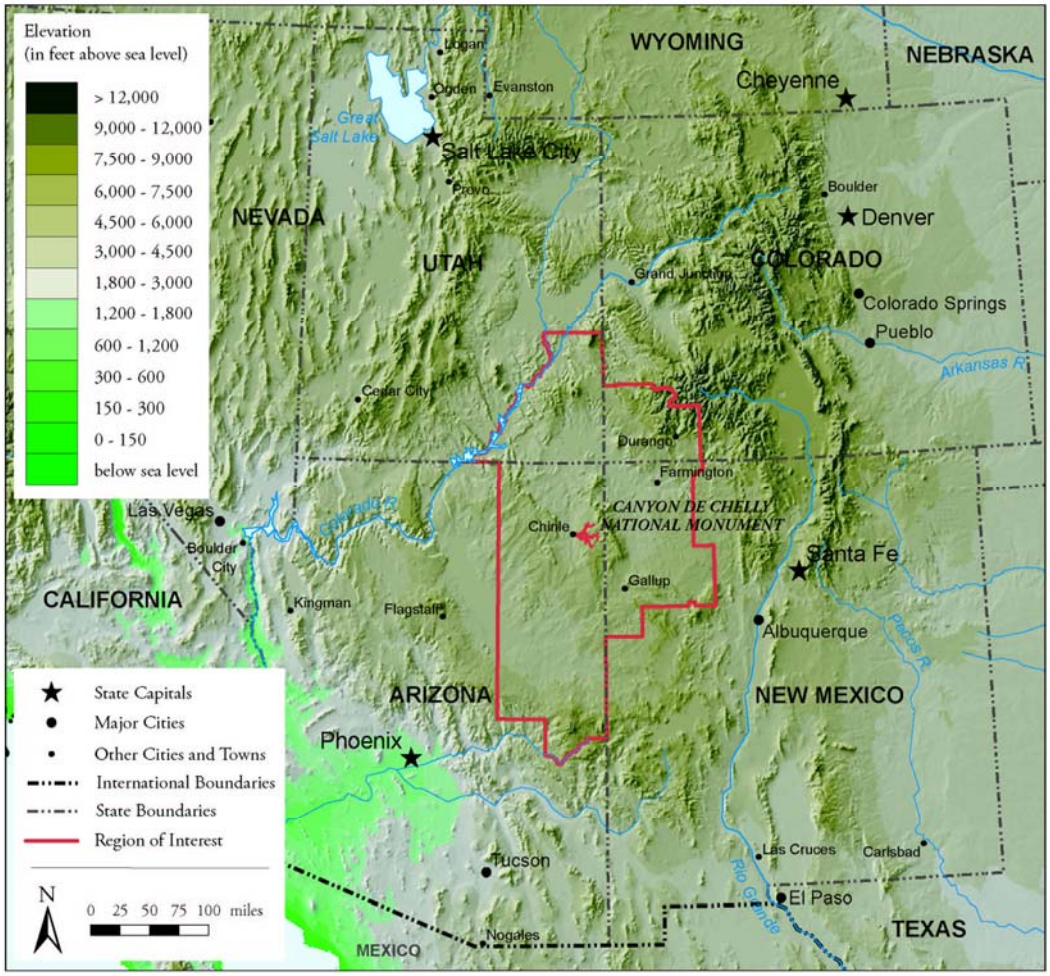

Figure 1. Canyon de Chelly National Monument and Its Region.
(Reprinted from McKendry et al. 2004, p.9).

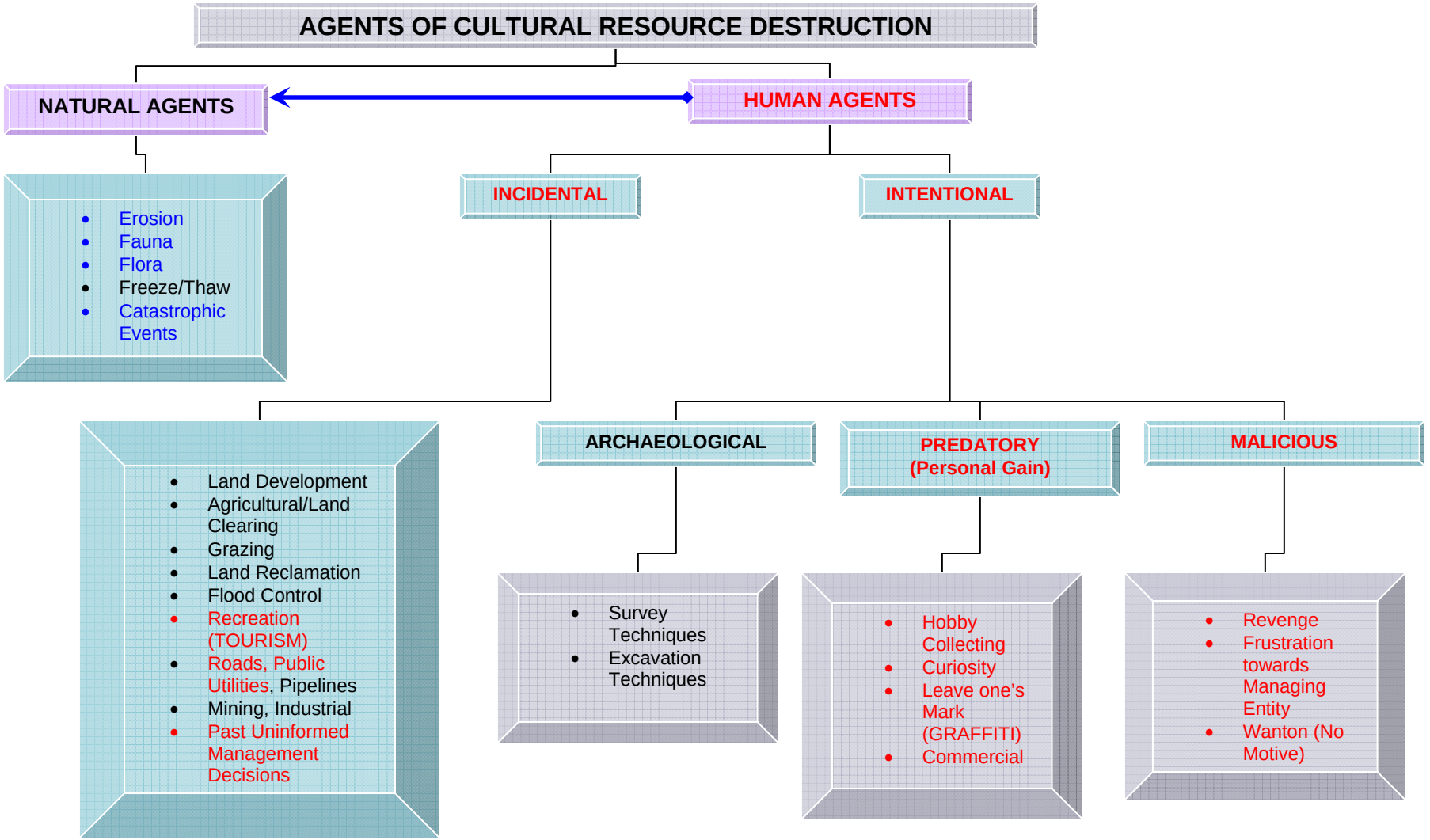

Figure 2. Flow Chart diagramming the processes which can negatively affect heritage resources. Items in red are related to the promotion of cultural resources. Note that Human Agents may increase the rate of Natural Agents (shown in blue). (After Nickens et al. 1981, Figure 2, p.12).

resources of Canyon de Chelly, to determine the factors that have attracted visitors, vandals and looters to certain sites, to compare those data to other estimates, and will offer potential solutions to curtail future vandalism.

There have been many estimates as to the amount of vandalism that has already occurred in the region; Martin McAllister performed an analysis of known sites on National Forest Lands in Arizona and estimated that 50% had already been vandalized (1980). A 1987 Government Accounting Office (GAO) report has claimed that one-third to one-half of all *known* sites in the southwestern U.S. have been "damaged by theft or defacement to some degree" (Christensen et al. 1996, p.118). These estimates are dated, and do not specifically address the amount of archaeological vandalism at Canyon de Chelly.

Of all the agents that affect cultural resources, those that are human-caused, malicious and predatory can be the most detrimental. Despite this, they are also the most preventable. McAllister et al. state that the identification of sites that may be targeted for looting and defacement is essential, especially in the "Western United States where investigators are faced with a large number of sites spread over vast and often remote areas"

(1984, p.162). It is hoped that the findings of this project will provide the groundwork for a plan to protect the cultural resources of Canyon de Chelly National Monument from unnecessary destruction.

Misconceptions of Archaeology

Although archaeology has been practiced for hundreds of years, some misconceptions about its goals still exist. This is fueled by the long history of antiquities collection and media depictions of archaeologists as good-looking, swashbuckling adventurers looking for priceless objects without notebooks in hand; *Indiana Jones and the Raiders of the Lost Ark*, (Lucas and Kazanjian) *Opening the Lost Tombs Live from Egypt* (Brown and Miller 1999), and the History Channel's *Digging for the Truth* (2005) are some of the most notable.

Recent surveys show that the public's perception is still somewhat idealistic. Although a 1989 public survey of 300 households in British Columbia, Canada found that 94% of respondents knew that archaeology was the study of the "remains of past cultures", 84% still believed that archaeologists excavate valuable art objects and purchase artifacts solely for museum collections (Pokotylo and Mason 2000, p.3). Conversely, many

museums still view archaeological expeditions as merely a method to "stock their shelves" (Potter 1997, p.37).

Many indigenous groups also feel that this is chief concern of the profession, and have concluded that archaeologists are no more than glorified looters. Some native groups even repudiate the value of archaeological research over their values (Meighan 1984, Downer 1997). This ethical debate has continued to generate a multitude of work regarding differing perspectives; the historically contentious relationship between indigenous groups and archaeologists has grown more respectful in recent years. Despite divergent opinions, there is at least one commonality between both factions: they agree that cultural resources deserve protection.

While public archaeology and interpretive programs are doing their best to combat these misconceptions, archaeologists must work closely with interested stakeholders, publish their work in a timely manner, and allow access to archaeological field investigations when appropriate (SAA 1996, Stone, 1997, Bundy 2008).

Threats to Cultural Resources

The agents that threaten cultural resources may be caused by natural or cultural agents. Because they are typically unavoidable and tend to occur more slowly than cultural actions, natural causes will not be discussed in this study. Human-caused agents are of two types: incidental and intentional. Incidental activities are defined by Nickens et al. (1981, p.16) as those which "are incidental to or associated with … land development and exploitation". The destruction of archaeological sites is not a motive for destruction. The same authors identify intentional agents as those that are "inherently harmful to the resource and, in almost all cases, are guided by motives which are difficult to control or prevent" (Nickens et al. 1981, p.21). Intentional agents are further subdivided into three types of vandalism: (1) archaeological, (2) predatory and (3) malicious (Nickens et al. 1981, Nickens 2000). A fourth controversial type, called ritual obliteration also exists. All four types are explored below, but the focus of this study is those that are illicit, predatory and malicious.

Archaeological vandalism, or "institutionalized destruction", is the loss of data that occurs during every archaeological investigation. Although destructive, this type of vandalism does not occur with the primary

objective of destroying data; rather the opposite. This was more common in earlier days, but the development of the scientific method and the adoption of the Society for American Archaeology (SAA) "Principles of Archaeological Ethics" (1996) in recent years have decreased the amount of data that is lost. Despite this, the potential for loss still exists and is dependent upon factors such as professional expertise, data recovery and recording methods, and constraints in funding and time.

Predatory vandalism is motivated by personal profit; it can be commercial or noncommercial. Commercial actions include theft and selling of archaeological materials for financial gain, while non-commercial actions may be motivated by curiosity and can include the personal collection of archaeological material. Predatory vandalism includes looting, collection of artifacts from ground surfaces, defacement, arson, destruction of archeological features and structures, and rearrangement of resources within an archaeological site (Figures 3, 4). Predatory vandalism is extensive in scope; it has occurred worldwide, throughout history and is exceptionally destructive since archaeological contexts are lost.

Figure 3. A NPS Archaeologist views a visitor created “show-me” pile of artifacts at Yucca Cave Ruin.

Figure 4. Overview of Basketmaker storage cists at site CWC 006 in 1949 *left*, same site in 2006 showing looted cists and back dirt piles *right*.

Malicious acts, sometimes called "vindictive vandalism" (Goldstein 1996, p.32), is "difficult to precisely define" (Nickens et al., 1981, p.25) and is extremely destructive to the resource. It is usually motivated by revenge, and is antagonistic towards a particular person, group or government organization. It can include wanton destruction, that which is motivated by psychotic tendencies, or which is performed while under the influence of drugs or alcohol (Goldstein 1996, Nickens 2000). Luckily, this form of destruction occurs less frequently, but it can be the most devastating of all vandalistic behavior.

Finally, acts of ritual obliteration and destruction have occurred to archaeological sites around the world; this has happened in historic times, such as the ritual obliteration of a pharaoh's image by his successor or later religious zealots in Egypt, and it is still occurring today (Weeks et al. 2006). In the Southwest, ritual obliteration may occur during certain Native American healing ceremonies. Sometimes included in these rituals, is the instruction to destroy particular rock art symbols or other archaeological features which are perceived as harmful to an afflicted person (Figure 5).

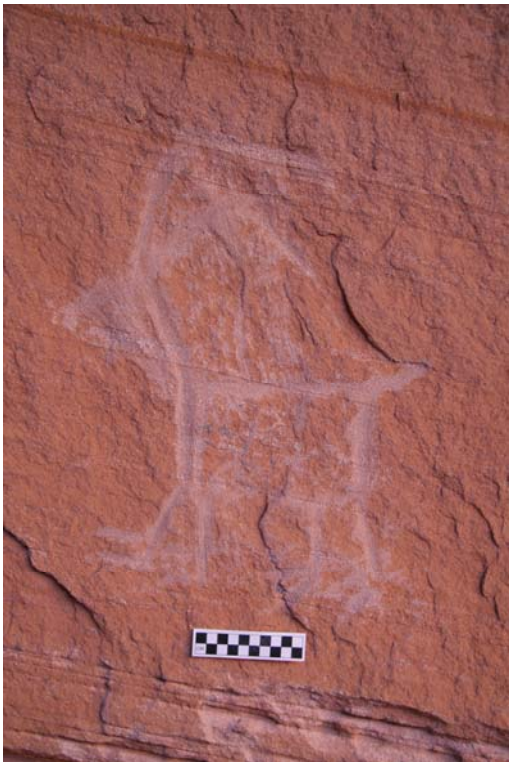

Figure 5. Potential ritual obliteration of petroglyph at site CWC 023.

Figure 6. Advertisement selling archaeological artifacts. Name of gallery and contact information has been blurred.
(Reprinted from Smithsonian Magazine).

Although under Navajo Nation Law and the American Indian Religious Freedom Act (AIRFA) this is considered an act of religious freedom, it would be considered a violation under ARPA. Adding confusion, ritual obliteration is also currently practiced by some followers of the New Age faith (ARARA 1995). Needless to say, ritual obliteration is a controversial subject among indigenous peoples and scholars. Although obliteration is intentional, its motives are completely dissimilar to those of the formerly discussed agents.

Most visitors are unaware that their foot-traffic and touching of features and rock art is destructive, so this sort of activity has been deemed incidental. Although not malicious, damage resulting from visitation to sites is also explored in this study because entry to all archaeological sites at Canyon de Chelly National Monument is prohibited by both Navajo Nation law and Park Policy. Sites may be viewed by visitors from a distance, but may not be physically entered.

Archaeological Vandalism

Archaeology is undeniably rooted in a tradition of antiquity collecting that began as early as the mid-18th century, when wealthy, educated amateurs began exploring the ancient sites of Europe and the Middle East to collect artifacts for display in their homes and museums (Fagan 1985, Ceram 1986, Renfrew and Bahn 2004). Ownership of antiquities became a status symbol to many affluent persons and institutions; after the French occupation of Egypt, it seems that anyone of means desired an ancient mummy (Hobson 1987).

Although a younger practice in the Southwestern U.S., pothunting is entrenched as a cultural tradition dating to the late 19th century when explorers, surveyors, and settlers pillaged the conspicuous ruins of the Ancestral Puebloans; it was often a weekend hobby to take a family picnic next to an ancient ruin and come away with pots (Nickens et al. 1981, Snead 2003). Towards the end of the 19th century, scholars began professionalizing archaeology, while hobbyists still abounded (Snead 2003, Bundy 2008). Despite its growth as a scientific discipline, the earliest expeditions were funded by museums or individuals looking solely for

acquisitions, and were haphazardly implemented with no regard for information potential.

At the close of the 19th century, professional archaeologists were growing increasingly troubled by the wholesale destruction of archaeological resources in the Southwest. Following the designation of Casa Grande Ruins as a "National Reservation, reserved for its cultural value" in 1904, the Antiquities Act was enacted by President Theodore Roosevelt in 1906 (Rothman 1994, p.12). The Act afforded protection to all antiquities on federal lands, allowed the President to designate significant areas as National Monuments, authorized The Secretaries of the Interior, War and Agriculture as the only entities that could grant excavation permits, and established fines for violations.

Due to its immediate need, the Act was hastily drafted and enacted, and left many administrative gaps. In particular there were no provisions for monument funding, so although monuments were created, their administration was overlooked (Rothman 1994). Although the Act had closed loopholes in legislation, there were still no guardians in place or funding for work at the monuments until many years later. As Rothman

states, "effective preservation had yet to be achieved" (1994, p.49). Because of the inadequacies of the Antiquities Act of 1906, it is difficult to assess the immediate effectiveness on looting.

The Antiquities Act was vaguely-worded, and hindered the prosecution of offenders, so it was clear that additional legislation was needed. The deficiencies of the Act allowed looting to continue throughout the 20th century; higher pothunting rates occurred during times of economic depression. The late 1970s witnessed an increased effort by archaeologists to publicize the negative effects of archaeological vandalism and to create additional legislation for the protection of cultural resources. The Archaeological Resources Protection Act (ARPA) was signed into law in 1979 and is the current means of prosecuting looting and vandalism cases on federal land. Despite increased legal protection, cultural resource destruction is still occurring at an alarming rate, and the trade in illicit antiquities is flourishing (Nickens 1991, Brodie et al. 2002, Childs 2008).

The Importance of Archaeological Preservation

Archaeological resources have what is termed 'Academic Value' and 'Cultural' or 'Humanistic' Value (PMAP 2005, 9.2). That is to say, people deem cultural resources important for various reasons; indigenous groups consider ancestral sites as central to their spiritual traditions and as a tangible link to their past, while the data available from the study of sites is essential for archaeologists and other scholars to interpret past life ways, and the information gleaned from both scientific and ethnographic information is of great interest to society. This is evidenced by the popularity of heritage resources as vacation destinations and the production of popular media related to the subject of archaeology and ancient history.

In the human psyche, there is an innate curiosity about the past and therefore a wide-ranging interest in the subject of archaeology. Davis (1978) in Pokotylo and Mason (2000) identifies five main reasons for this: (1) romanticism, (2) aesthetics, (3) the nature of the human community, (4) social roots, and (5) technical avocation. The love of archaeology and antiquities are inextricably intertwined; widely-read scientific-based periodicals, such as Smithsonian Magazine, consistently run advertisements publicizing notorious antiquities dealers (Figure 6). Conversely, an

infamous collector's journal named, "Minerva" publishes articles regarding recent archaeological discoveries (Eisenberg n.d.). Although the public's interest is generally positive, it is crucial to understand that curiosity may also motivate people to own artifacts which are sometimes illicitly obtained.

While the subject of archaeology is highly publicized and romanticized by the mass media in movies, magazines and television, the associated story of cultural resource destruction for the pursuit of objects is noticeably absent. Despite this, a majority of the public desires that cultural resources are protected (Pokotylo and Mason 2000, SAA 2000). Those that do not, although a minority, can cause irreparable damage to resources.

The reasons for this divergence are countless: some simply do not understand the importance of the past, the laws that protect cultural resources, or the concept of a conservation ethic, while others such as looters see heritage sites as resources to be exploited for personal gain. The malicious act of looting is the most aggressive and dangerous of the human agents that affect sites, as it not only destroys the resource, but there is also a synergism that exists between it and other crimes.

Although the theft of antiquities is one of the "least recognized and analyzed forms of criminality" (Lane et al. 2008, p.1) it is vital that we investigate it, as there is increasing evidence that the international trade in antiquities is connected to other corruption - especially drug manufacture, purchase and use (Brodie et al. 2002, Fidler 2003, White 2006, Browning 2007, Berger 2008). Oftentimes, artifacts bound for collectors' shelves are transported from country to country alongside other illicit material. It is surmised that money laundering also occurs during the transport and purchase of both of these items (El Din 2004, Atwood 2008).

Locally on the Navajo Nation, the sale of antiquities is most certainly used to purchase drugs and alcohol (R. Maldonado, Navajo Nation Historic Preservation, personal communication, 2006). Additionally, professional looters and smugglers may target archaeologists, site guards and law enforcement personnel for acts of violence. Most importantly, antiquity trafficking (and even the sale of forged antiquities) has recently been linked to terrorism financing (Leyden n.d., Shelley 2006, De La Torre 2006, Atwood 2008). This connection and its importance to the safety of law-abiding citizens has not been widely publicized, therefore more stringent legislation and enforcement has not been enacted.

Prevention

Legislation

Legislation is obviously the most important method of deterring vandalistic activity, however apprehending and prosecuting perpetrators is complicated. Ownership of cultural property is contested throughout the world, and protective legislation is continually subjected to courtroom tests (Renfrew 2000, Hutt et al. 2004, Hutt 2006). Unfortunately in the U.S. most resources on private and state lands go unprotected, and most looting on federal land occurs in remote locations and during off-hours, so there is little chance that perpetrators will ever be caught. Instead, evidence is usually found quite some time after the act has occurred and the suspects have vanished. If apprehended, it is often challenging for prosecutors to prove the origin of recovered artifacts. Moreover, some laws indicate that the perpetrator must have knowledge that they committed a crime. Although some cases have been successful, it is nearly impossible to prove that a defendant knew the law (Vitelli 1984). Despite these obstacles, legislation is still the most vital mechanism to protect cultural resources.

There are two types of Federal legislation enacted for the protection of cultural resources: compliance and enforcement laws. The two types are not always independent; some laws have both a compliance and enforcement component (Hutt et al. 2004). Compliance laws are enacted by congress so that federal agencies follow protocol for the inventory, management and protection of resources. Enforcement laws are enacted to make certain activities by non-agencies illegal, and to provide penalties for violations. For the purposes of this dissertation, I am interested in illicit activities committed by individuals on Department of the Interior (DOI) and Navajo Nation Tribal property, and so my focus will be their relevant enforcement laws.

As discussed above, the Antiquities Act was not successful in curbing looting; however it was effective in designating protected areas. Most NPS regulations were framed upon the Act, and it was the sole statute to provide resource protection for seventy-three years (Hutt et al. 1992). ARPA was passed in 1979 to protect the irreplaceable archaeological resources on federal land in a greater capacity than prior laws, and to support the professional collection of archaeological data (Coggins et al. 2001). It also provides indigenous peoples with a voice in the permitting process on non-

tribal lands, and enables them to institute resource protection laws on tribal lands. ARPA lengthened the list of resources that are protected by defining them with an inclusive phrase as the "material remains of past human life or activities which are of archaeological interest… [and which are] at least 100 years old" (ARPA 1979).

ARPA also included additional criteria for the permitting of archaeological work, and created a way to assess the monetary value of incurred vandalism for presentation during prosecution. It provided what was missing from previous legislation: criminal penalties that are specific to archaeological resources. Violators may be prosecuted under misdemeanor and felony sanctions (Hutt et al. 1992). Federal agencies were allowed to issue supplemental regulations to ARPA; DOI did so in 1987 when they specifically designated Traditional Cultural Properties (TCPs) of any age on the protected list (Coggins et al. 2001). ARPA is the most comprehensive piece of legislation enacted to protect cultural resources so far.

Despite the increased protection afforded by ARPA and the numerous successful prosecutions since its enactment, the law has limitations. An included provision allows the lawful collection of

arrowheads from the ground surface of federal land, thereby forcing land managers to prove that projectile points in a suspect's possession were excavated. Additionally, some judicial opinions are still unfavorable (Hutt 2006, Bundy 2008). Land managers must have comprehension of additional regulations that can be utilized in conjunction with ARPA, and the public's knowledge of resource protection laws is equally important. Citizens must understand the importance of resources, and be encouraged to report illegal activities on public lands.

In 1990, the Native American Graves Protection and Repatriation Act (NAGPRA) was passed to provide additional protection to Native American, Alaska and Hawaiian Native remains, grave goods and sacred items. NAGPRA addressed the concerns of native groups regarding ownership and repatriation issues. It included provisions for the handling and treatment of these objects when cared for by federally-funded institutions; an inventory of NAGPRA items and consultation with affiliated tribes is required. The law also dictates that when human remains are discovered inadvertently, ground disturbing activities must cease, the remains must be protected, tribal consultation must take place, and notice of the discovery must be published. NAGPRA is only administrative; it does

not create any new rights for Native Americans, nor does it make the possession or excavation of Indigenous human remains felonious. This is only covered by ARPA and any existing state, tribal or local laws (Hutt 2006).

The Navajo Nation Cultural Resources Protection Act (NNCRPA) is a law similar to ARPA. It cites that the major role in cultural resource preservation should be maintained by the federal and state governments, but encourages the Navajo Nation to develop its cultural resource preservation program (NNCRPA 1995). Actions prohibited by NNCRPA are identical to ARPA, but included is a clause against unauthorized ethnographic research in which only traditional religious practitioners are exempt. It also includes provisions against unauthorized visitation of cultural properties by non-tribal members. There are both civil and criminal penalties for the violation of this regulation, just as in ARPA.

The NPS has federal legislation, internal policies and directives to guide the management and protection of resources under its care. In addition to ARPA and NAGPRA, the United States Code of Federal Regulations dictates the laws and penalties specific to the management and

protection of NPS administered areas. It grants NPS superintendents the authority to establish policies specific to their park which may include closures of unsafe or sensitive areas. With one exception, non-local visitors to Canyon de Chelly (including Navajos) are required to obtain a permit for their activity and be accompanied by local Navajo guides who undergo required NPS training. Violators of park-instituted regulations and federal laws are subject to fines and potential imprisonment.

NPS also relies on Executive (Presidential) Orders, Director's Orders and NPS Management Policies which all offer additional guidance in park planning and management. Management Policies dictates that the "most effective concepts, techniques, and equipment [will be utilized] to preserve cultural resources" (NPS 2006a, p.65). All of these documents have the preservation of resources, both natural and cultural, as their core objective.

Legislation is still the primary method to deter vandalism, but it is important to understand that laws alone will not solve the problem (Pokotylo and Mason 2000). It is crucial that laws be consistently enforced, or they are rendered ineffective (Lane et al. 2008). Furthermore, public outreach must be used to expand awareness of heritage resources and the

laws that protect them. An absence of capable law enforcement officers, successful prosecutions, and public knowledge will allow a fragmentation of the control process and a perpetuation of the problem.

Interpretation and Education

Although legal methods are a crucial tool for defining archaeological vandalism and prosecuting violations, regulations must be integrated with public outreach programs. Archaeologists have been accused of foregoing their responsibility in educating the public about their goals and methods, and have been notoriously bad at publishing their findings in a timely manner and through media that is easily accessible to the general public (Cockrell 1980, Henry Renaud 2002, Wildeson 1984, McManamon 1993). Archaeologists have been so protective of their data that they often fail to engage the public; this has caused suspicion of the profession and apathy regarding resource protection. Recent ethical debates have shed light upon this dilemma, so professional attitudes are changing. Archaeologists are becoming cognizant that an improved public opinion promotes awareness and shared stewardship of our heritage.

A 2000 SAA survey indicated that the public's concept of what archaeologists do "is neither solid nor clear" (p.14). It is obvious that research objectives are not disseminated, as it is still widely assumed that the acquisition of objects is a primary goal (Nickens 1991). This probably results from the emphasis given to archaeological objects in museums, without the concurrent presentation of method and theory. The outcome is a confused public that cannot distinguish archaeologist from looter. As archaeologists, we have an ethical responsibility to convey the chief concern of the profession; we need to emphasize the importance of the information that proper investigation can convey.

The public believes that education is the best method to prevent resource destruction; a majority (90%) think archaeological education should begin as early as kindergarten and that it should be incorporated into every school's curriculum (SAA 2000, p.18). Currently, television programs are the primary means the public uses to learn about archaeology (56%), while less than 5% are educated at cultural sites, through lectures, or cultural and historical events (SAA 2000, p.17). It would behoove archaeologists to work with local indigenous peoples, heritage sites, schools, museums and other groups to develop programs, displays, interactive

computer media, and general publications to increase the diversity and amount of information that is disseminated to the public.

Physical Controls

Physical barriers and signs have proven to be low-cost, effective means of not only deterring illicit activity, but in increasing awareness that sites on public lands are protected (Nickens et al. 1981).These deter a certain segment of the population, but a recent conviction shows that even the most presumably virtuous citizen may not be discouraged, so vandals intent on their target are usually unaffected (NPS 2006b). Despite this, the use of these techniques should continue; the most vulnerable or damaged sites should be identified and prioritized for protection.

The Perpetrators

Looters are of two primary types: "casual" who obtain artifacts for personal collections, and "commercial" who "obtain artifacts for sale to others" (GAO 1987, p.3). The SAA has further divided these types into: professional looters, intensive collectors, casual collectors, and defacers (1990). These perpetrators and their motivations are explored in more depth below.

Professional looters include those who destroy archaeological contexts in their quest for marketable items, but also include those who indirectly profit from this activity such as art dealers. They are motivated by economic factors: the demand for antiquities, the high-prices they command, and notoriety. Looters are sometimes motivated by the absence of what Lane et al. call "capable guardians" (2008, p.3) and the low recovery rates of stolen art objects (Nickens 1991, Longenecker and Van Pelt 2002, Bundy 2008). Oftentimes in depressed economies with indigenous cultures, looting can be viewed as a birthright. Several generations of villagers from the small town of Qurna, Egypt have looted the tombs beneath their community to supplement incomes. Even though looting rates have diminished, the Egyptian government has moved over 70% of the population to inhibit further resource destruction (Humphries et al. 1999, Meskell 2005, Seel 2007).

Intensive collectors are those persons that collect for "personal satisfaction and enjoyment of the artifacts" (SAA 1990, p.12); their motivation is not economic, but usually genuine interest. They may loot themselves, both by surface collecting and excavation, or purchase items

from dealers. They are cognizant that their actions may be illegal, but they still tend to have large collections. They may also be patrons of institutions and loan or donate objects for display.

Opportunistic collectors usually have smaller collections than intensive collectors. These collectors do not intentionally search for archaeological material, rather they collect objects from the surface of the ground when found while engaged in other activities such as farming or hiking; their "casual interest in the past" is their only motivation (SAA 1990, p.12). Informant interviews in Southwestern Colorado, where both types occur, showed a clear difference between the casual and intensive collector (Table 1). Casual collectors typically have little knowledge of laws and the harm that they cause, do not usually engage in the sale of antiquities, or place dollar values on their collections (Nickens et al. 1981). Despite this, even collections that were casually obtained may be inherited by others who eventually sell them on the antiquity market (Bundy 2008).

# Items	# Informants (n=20)	Percent
No Answer	2	10%
Under 20	4	20%
20-50	4	20%
51-100	1	5%
101-500	6	30%
Over 500	2	10%

Table 1. Collection Size in Southwestern Colorado
(after Nickens et al. 1981, Table 16)

Defacers can be of two sorts; intentional, who may be "associated with rebellion, addiction, subculture membership, peer pressure or deviant ritualism" and unintentional, who are "motivated more by fun or interest and … are ignorant of their damaging effects on the resource" (SAA 1990, p.12). Actions can be as thoughtless as scratching a pictograph to identify pigment, as hostile as writing a racial epithet across a rock art panel, or as destructive as burning an historic structure to exact revenge upon the owner (Figure 7). Intentional vandalism is oftentimes carried out by small groups of minors, who have little comprehension of property ownership, resource relevance, or the impacts of their actions (Goldstein 1996).

The cultural resources of Canyon de Chelly National Monument are undoubtedly threatened by these human-caused agents. Understanding the

historic nature of archaeological vandalism and quantifying existing damage is the first step in understanding the problem.

Figure 7. The author records gang-related graffiti near an archaeological site.

CHAPTER II

CANYON DE CHELLY NATIONAL MONUMENT

Culture History of Canyon de Chelly

Canyon de Chelly is comprised of two main canyons and numerous smaller side canyons (Figure 8). The canyon is famous for its prominent, well-preserved Puebloan and Basketmaker sites and its abundant rock art, but the canyon contains a broad range of site types dating from the Archaic Period to modern times (Table 2). Although the area was probably utilized by Paleolithic peoples, little evidence exists to confirm this. Geometric petroglyph panels and small Archaic campsites comprised of lithic scatters and hearths are the earliest evidence for occupation.

The remains of Basketmaker structures and extraordinary pictograph panels have enticed scholars and visitors to visit for nearly two centuries. The Basketmaker Period, named for its tightly-woven baskets and water bags, witnessed increasing use of the canyon floor and alcoves as agricultural methods evolved. The floor was used for seasonal family-based habitations which consisted of temporary semi-subterranean homes of earth,

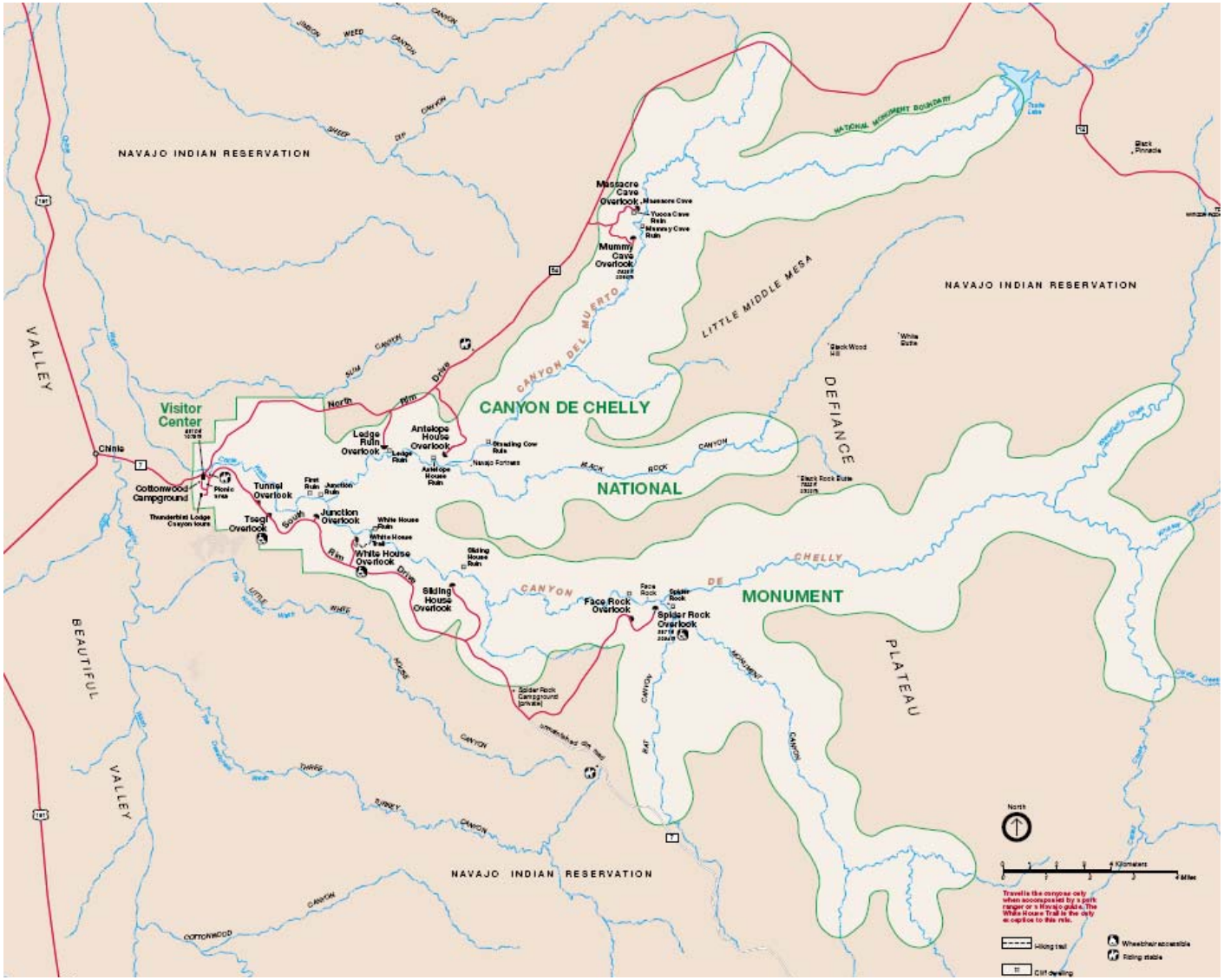

Figure 8. Map of Canyon De Chelly National Monument (NPS [n.d.])

wood and vegetal material (Figure 9). As the Basketmakers began to rely more heavily upon their crops, they aggregated into larger and larger communities, they built their pithouses and storage structures on canyon-bottom terraces and into cliff alcoves using more resilient materials such as flagstone for floors and large, upright sandstone slabs for walls (Figure 10). Extensive panels of multicolored pictographs depicting large humans and supernatural beings, handprints, birds, atlatls and game animals were created alongside storage cists in dry, protected alcoves (Figure 11). Towards the end of the period, the atlatl was replaced by the bow and arrow, and baskets were lined with air-dried clay, paving the way for the development of kiln-fired ceramics in the Puebloan period.

Table 2. Canyon de Chelly Chronology

Period	Date
PaleoIndian	10,000-5500 BC
Archaic	ca. 3000-500 BC
Basketmaker	ca. 500 BC. - AD 750
Ancestral Puebloan	ca. AD 750-1350
Transitional Puebloan	AD 1350-1700
Historic Navajo	AD 1700-1930
Historic Euro-American	AD 1700s-1930
Modern Navajo	AD 1930 to Present

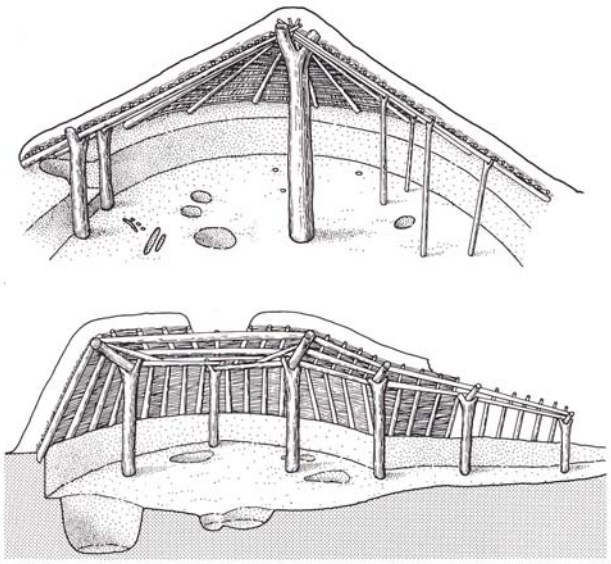

Figure 9. Cut-away and cross-section illustration of Basketmaker pithouse.
(After Martin 1979, Figure 6, p.67).

Figure 10. Remains of Basketmaker pithouses at Carroll Dam Cove site.

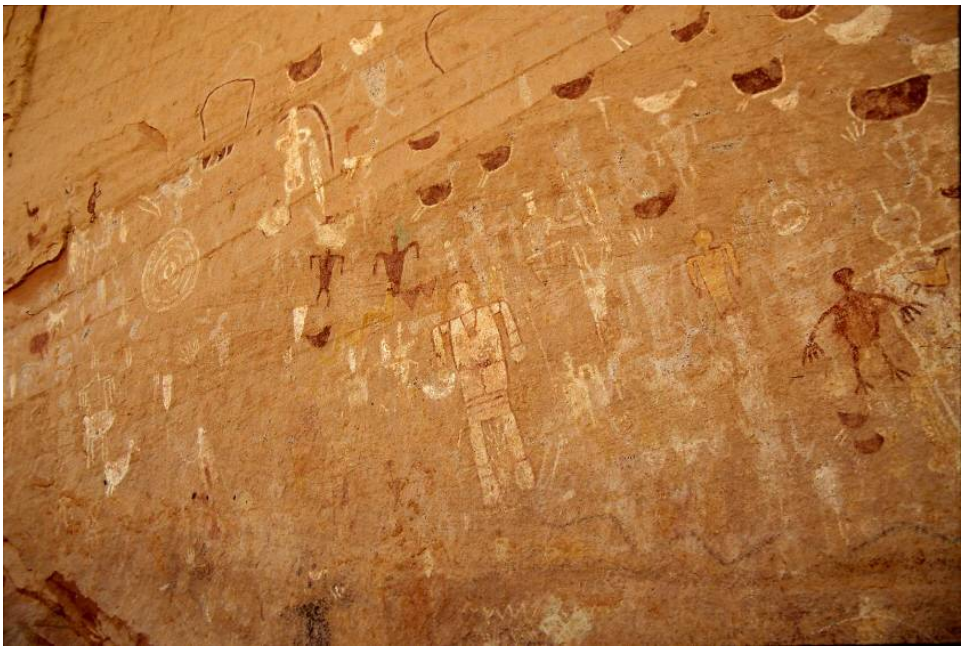

Figure 11. Typical Basketmaker rock art panel. Blue Bull Ruin.

Figure12. Mummy Cave Kiva overview.

The Pueblo period saw Basketmaker pithouses develop into fully subterranean ceremonial structures called kivas; this suggests a growing clan-based society (Figure 12). Early Pueblo habitation structures were above-ground, square-room, contiguous wattle and daub (jacal) structures. Through time, these eventually expanded into multi-story, coursed masonry walls (Figure 13). The Puebloans built their dwellings on the canyon floor at the base of cliff walls, and also in the same alcoves that the Basketmakers had inhabited. Weaving continued, but the use of pottery became widespread because of its ease of manufacture and expendability. No evidence of a ceramic type particular to Canyon de Chelly has been discovered; most appear to come from the Great Pueblo Mesa Verdean and Chaco culture centers (Grant 1978, Remley 1993). Cotton was introduced to the area from the south; the canyon floor, with its intermittent floods, was a perfect environment for cotton production. Puebloans produced tightly-woven cotton clothing and other items, which probably provided them with a highly-valued trade good.

Population growth, pressure from northern nomadic tribes, and increasing aridity and erosion most likely encouraged Pueblo people to migrate eastward to the Rio Grande Valley and westward to Antelope Mesa

Figure 13. Overview of Mummy Cave Ruin Tower Complex.

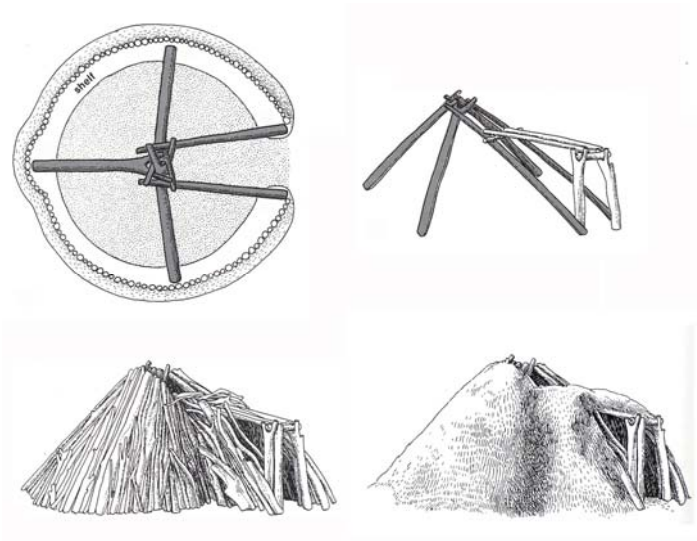

Figure14. Illustration of early Navajo Forked-stick Hogan construction.
(After Witherspoon 1983, Figure 9, p.532).

sometime in the thirteenth century. Canyon de Chelly became a crossroads for travelers, exhibiting Mesa Verdean construction dating to the late 1200s (Grant 1978). The current settlements of Hopi and Zuni probably represent the final destinations of the prehistoric Pueblo, although the canyon was still seasonally farmed by the Hopi well into the 18th century.

Sometime in the 15th century, nomadic Athabascan people migrated into the Four-Corners region from the northwest coast of North America (Brugge 1983). These hunter-gatherers were the ancestors of the Navajo people, who still inhabit the canyon today. They had both peaceful and aggressive interactions with the Hopi and other tribes, and gradually adopted an agrarian lifestyle, settling in the canyon for its water and arable land. The Navajo brought with them a distinctive architectural form, the hogan. Earliest incarnations were created with forked logs, which eventually developed into the octagonal structures of cribbed logs or masonry still used today (Figures 14, 15).

The earliest evidence of Navajo occupation at the canyon comes from a forked-log structure that produced a tree-ring date of 1753 (Remley 1993, p.5.7). At this time, Spanish explorers were increasingly in the region, and

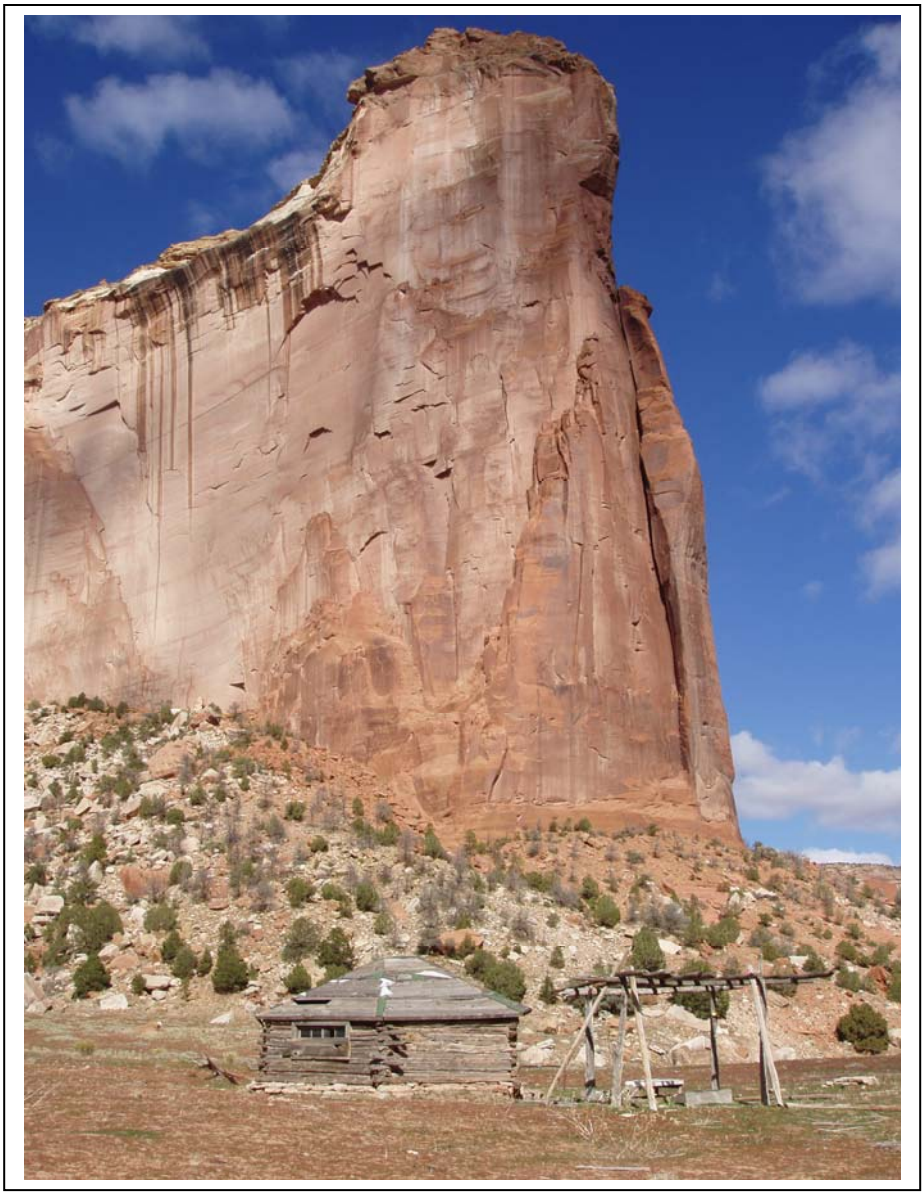

Figure 15. An historic Navajo cribbed-log Hogan and shade structure are prominent features in the landscape, despite a towering cliff.
Photo by author.

sheep, cattle and horses were introduced. The Navajo adopted herding as a primary lifestyle in other regions; however agriculture was vital to the Navajo of Canyon de Chelly and remains so to this day. Increasing numbers of altercations with the U.S. military in the 1800s led to the forcible removal of the Navajo from the canyon and surrounding areas to Fort Sumner in 1864 (Remley 1993). The internment ended four years later, when the Navajo signed a treaty with the United States establishing the Navajo Reservation. Their homeland was reduced in size, but still included Canyon de Chelly serendipitously placed at its center. Families returned to the canyon by 1869 and began rebuilding their fields, their herds, and their lives (Grant 1978).

Today the canyon is still home to a Navajo community; approximately 50 families live on the rims and have seasonal residences on the canyon floor. The Navajo have ascribed their own stories to the canyon topography and long-abandoned archaeological features. Knapp and Ashmore (2000) state that "seemingly abandoned monument(s) (are) still part of an active landscape". This was true in the past, and remains true, as people still make pilgrimages to the canyon to see a piece of history and seek their own sense of place.

Vandalism at Canyon de Chelly

The earliest documentation of looting at Canyon de Chelly occurred prior to the enactment of the 1906 Act or the establishment of Canyon de Chelly as a National Monument (Brugge and Wilson 1976). Professor Henry Baum of the 'Records of the Past Exploration Society' visited the canyon in 1903, noting vandalism committed by commercial looters. Baum wrote a letter to the U.S. Department of the Interior (DOI) stating that the local guardian was too remotely stationed to protect the ruins, and that he felt a trader, Charles L. Day should be named a custodian.

The Navajo Agent from Fort Defiance, Arizona appointed Day as the caretaker, paid him an annual salary, and deputized him. Unfortunately, it was soon reported that Day and his father had been collecting artifacts to sell them to the Brooklyn Museum (Brugge and Wilson 1976). Day was not dismissed, and in following years he did report and ship finds to the U.S. National Museum, so he may have changed his ways. By 1905, Day had moved, and in following years his position was refilled by various local officials.

Archaeologists noted that looting was continuing unabated despite the appointment of caretakers. Adding stress on the resources were increasing numbers of expeditions and tourists; as the local traders were beginning to accommodate them. Canyon erosion was also becoming problematic; in 1917 a local agent informed the Indian Service that White House Ruin was endangered by the intermittent flow of the canyon wash. It was recommended that the Canyon become a national monument so that the Park Service could monitor and stabilize the resources; however this did not occur until fourteen years later (Brugge and Wilson 1976).

At that point, the country was in the throes of the Great Depression, and the region suffered from weak social control. These factors almost certainly coalesced to encourage looting in Canyon de Chelly and in other areas of the Southwest (Nickens 1991, Rothman 1994, Lane et al. 2008). Earl Morris, a 'Bureau of American Ethnology' (BAE) archaeologist who worked in the Canyon in the late 1920s, other archaeologists, and the Navajo Tribal Council realized the enormous significance of the Canyon, and so re-initiated the process of recommending the area for federal protection (Brugge and Wilson 1976).

Canyon de Chelly, located wholly on Navajo Reservation land, became a National Monument in April of 1931, which entrusted the NPS with authority over archaeological resources and visitors (Brugge and Wilson 1976, Remley 1993). The recent popularity of Earl Morris' work, the burgeoning field of Southwestern Archaeology, and the concerns of the Navajo people encouraged this declaration.

Unfortunately, this did not immediately slow illicit activity; a mere ten years after the Monument was created, an individual was apprehended with material that was illegally obtained from Mummy Cave Ruins (NPS 2005). Nonetheless, active guardianship was now in place, and growing numbers of rangers in the years prior to World War II were anticipated to deter future pothunting (Brugge and Wilson 1976). Even though the New Deal Era had ushered in a time of Federal reorganization and programs that increased the presence of federal workers throughout the U.S. (such as the Civilian Conservation Corps and Works Progress Administration), vandalism still occurred.

Prior to the late 1940s, no comprehensive survey of the Monument's resources had been completed; archaeological work had concentrated

primarily on the excavation of well-known, highly-visible Puebloan and Basketmaker sites. The first significant archaeological inventory was completed by Harvard student David DeHarport for his doctoral dissertation between 1948 and 1959. While his effort concentrated only on the southern canyon and was not systematic, he did note evidence of vandalism and looting in notes and photographs, which he then brought to NPS' attention (DeHarport 1960). In following years, he returned and produced a report which detailed the vandalism that had occurred since his original fieldwork (DeHarport 1962). Once again, he acknowledged that his work was unsystematic, but postulated that increased construction activity in the nearby community, the easy accessibility of sites, and the absence of rangers on the weekends were contributing to vandalism rates.

Between DeHarport's doctoral work and the 1990s, various institutions conducted fieldwork at Canyon de Chelly; however these projects focused almost exclusively on larger well-known sites, and were either problem-oriented or so small in scope that little standardized data was collected. At this time, the NPS was preparing for increased visitation, and was concentrating on interpretive and stabilization efforts at major sites (Brugge and Wilson 1976).

A controlled archaeological inventory did not occur until the Archeological Preservation Project (APP) of the 1990s. This project concentrated on inventorying all cultural resources on the floor of the northern canyon system (Canyon Del Muerto), and all areas reachable without technical climbing (Remley 1993). This project produced the first set of standardized data collection forms, and consistently collected data regarding the condition of each resource and damaging agents. The APP recorded 756 cultural resources, including TCPs and Navajo Cultural Landscapes (Travis 1995, Travis 2008).

The APP made recommendations for the protection of threatened sites; however an unexpected change of personnel in 1998 complicated the execution of those measures. Despite this, all data from this project was input into two computer databases; one park-specific called the Canyon de Chelly Archeological Database (CACHAD) and one service-wide, called the Archeological Site Management Information System (ASMIS). These databases allow a detailed analysis of the data which may be used to compare site characteristics both within the park, and to other sites within the NPS system.

Between 1998 and 2006 very little archaeological survey work occurred. In 2006 two new surveys were commenced to collect data from cultural resources located within the southern canyon system. One project, the DeHarport Archaeological Site Relocation Survey (DASRS), was designed to revisit and record each site originally recorded by David DeHarport to today's standards. The other was designed to survey areas slated for invasive tree removal. Both of these projects have observed historic and recent graffiti and evidence of looting. Although these projects are still ongoing, the CACHAD and ASMIS databases have been updated regularly and form the basis for this analysis.

CHAPTER III

GOALS AND METHODS

Goals

Although there is an ever-growing quantity of literature regarding archaeological vandalism, one of the impediments to understanding the nature and quantity of damage is the lack of standardized empirical data (Nickens et al. 1981, GAO 1987, SAA 1990). This dissertation will compile data from the Canyon de Chelly archaeological database to answer the following research questions:

1. What types of cultural resource vandalism are present at the park?

2. How much vandalism has occurred at Canyon de Chelly and how does it compare it to that of other areas?

3. What site characteristics encourage vandalism at the park, and can we create a site vulnerability assessment based on those characteristics?

4. What recommendations can be made to protect sites identified as at risk and alleviate instances of unauthorized visitation, vandalism and pothunting?

Both qualitative and quantitative analysis will be used to answer these research questions. These methods will include review of archaeological and vandalism literature, a review of legal documents, and a statistical analysis of data collected by NPS over the last twenty years.

Methods

Literature Review

Literature review, a qualitative research method, was utilized in addressing almost every research question. Review of credible archaeological and legal literature identified archaeological vandalism sources and allowed a comparison of Canyon de Chelly's vandalism to that of other regions. It identified resource characteristics that encourage looting and enhanced comprehension of vandalism. A review of frequently used protective measures and an evaluation of their success at Canyon de Chelly were also completed.

Reviewed works were published and unpublished and included books, journals, newspapers, websites, official reports, databases, files, and theses and dissertations. Reviewed legal works included relevant laws and judicial decisions. Some sources included data that provided quantitative

information. All of this information was critically evaluated and synthesized to answer the research questions.

Statistical Analysis

Data Development and Organization

Canyon de Chelly National Monument encompasses 83,840 acres of which only 15% has been systematically inventoried (NPS 2003). There are 1212 known cultural resources, including archaeological sites, cultural landscapes and TCPs, but only 721 of those are recorded to federal standards. The dataset used for this dissertation contained sites that were recorded to this standard, since those included complete and accurate information on the variables deemed important for the study of vandalism. Sites missing information or that were deemed modern in age were culled from the database; this left an adequate sample size of 601 sites.

This dataset was collected during several projects, the most comprehensive being the APP survey of the 1990s. Additional data comes from the recent DASRS project, and irregular areas surveyed for compliance with §106 of the National Historic Preservation Act. All data was input into

the park databases which will allow the tabulation and analysis of information concerning illicit activity at archaeological sites.

While databases are a useful management tool, and their analysis can provide an accurate assessment of vandalism, it is important to realize that they have limitations. We want to deduce the condition of resources throughout the monument, yet only sites that are recorded to federal standards are analyzed. Therefore, the available sites will have to represent the target population to an unspecified amount. We must ask how and if the numbers generated by this project represent the total population of sites at the Monument.

Other biases exist that compound the data limitations. Since less than one-quarter of the monument has been inventoried for resources, and most studies have been concentrated on the floor of the canyon and in areas scheduled for development, areas that remain unsurveyed might produce dissimilar data. While we can presume that inaccessible resources located in the cliffs are more protected, the lack of survey data for these areas leaves many questions. It is likely that agents of destruction at sites within the canyon will not be similar to those on the rims, and that differing site types,

accessibility and visibility will contribute to vandalism rates distinctive to each topographical zone.

Statistical Methods

There have been abundant studies to identify the factors which correlate to the presence of archaeological vandalism (Nickens et al. 1981, Nickens 1991, Lane et al. 2008). These factors can be either regional or site-specific in scale (Table 3). Regional factors can include the area's history of looting and vandalism, a lack of guardianship, poor socioeconomic conditions, and the demand for antiquities (Nickens 1991, Bundy 2008, Lane et al. 2008). Merryman identified the disparity of wealth between source and market nations as an additional factor which increases looting; this is relevant at Canyon de Chelly since the Navajo Nation is relatively poor and is surrounded by a wealthy one (1986). While these factors may be quantified on a broad regional scale, this study necessitates only their qualitative examination. To address the majority of the research questions for the purposes of this dissertation, the quantifiable site-specific factors are more appropriate.

Table 3. Factors which Contribute to Archaeological Vandalism and Data Availability

FACTOR	QUANTIFIABLE?	REGIONAL OR SITE SPECIFIC?	QUANTITATIVE DATA AVAILABLE?
Accessibility	Yes	Site Specific	Yes. NPS Archaeological projects have consistently collected data regarding accessibility since 1990.
Visibility	Yes	Site Specific	Yes. NPS Archaeological projects have consistently collected data regarding visibility since 1990.
Site Density	Yes	Site Specific	Yes. Data can be calculated using NPS Management Sectors as a basis.
Site Remoteness	Yes	Site Specific	No
Site Chronological Type	Yes	Site Specific	Yes. Archaeological projects in Canyon de Chelly have consistently collected data regarding site chronological types since the Early 1900s.
Site Size	Yes	Site Specific	Yes. NPS Archaeological projects have consistently collected data regarding site size since 1990.
Site Characteristics	Yes	Site Specific	Yes. NPS Archaeological projects have consistently collected data regarding site characteristics since 1990.
Site Research Potential	Yes	Site Specific	Yes. NPS Archaeological projects have consistently collected data regarding site potential since 1990.
Previous Knowledge of Site	Yes	Site Specific	Yes. NPS Archaeological projects have consistently collected data regarding the common knowledge of archaeological sites since the1990s.
Presence of NPS Rangers	No	Regional	No. NPS staffing numbers are available, but no way to judge affect on resource.
Law Enforcement Presence	No	Regional	No. NPS staffing numbers are available, but no way to judge affect on resource.
Crime Rate	No	Regional	No. A socioeconomic atlas including crime rates for Canyon de Chelly's surrounding region was completed by the NPS in 2004, but there is no way to judge affect on resource.
Socioeconomic Conditions	No	Regional	No. A socioeconomic atlas for Canyon de Chelly and its surrounding region was completed by the NPS in 2004, but no way to judge affect on resource.
Public Disposition	No	Regional	No
History of Looting and Vandalism	No	Regional	No
Antiquity Demand	No	Regional	No

Common site-level factors include: ease of site access and visibility, density, chronological period and site physical characteristics (Nickens et al. 1981, Nickens 1991, Christensen et al. 1996, Bundy 2008). While the variables that may encourage vandalism are abundant, the two statistically measurable factors identified as most important are the relative accessibility and visibility of the resource (Nickens 1991, Christensen et al. 1996). Additional factors not mentioned by other studies, but which are crucial to assess are site size and research potential. Luckily, this information exists in park databases, making analysis unproblematic.

Pertinent information from park databases was exported and combined into a spreadsheet and was organized by keeping the variables associated with vandalism and looting in mind. Data was easily coded and entered into the Statistical Package for the Social Sciences (SPSS) Version 17.0 software. Statistical tests were used to quantify the amount of vandalism seen at Canyon de Chelly National Monument and to correlate damage with site characteristics.

The data matrix was inspected for errors, and then univariate analysis was completed to discover the parameters of each variable.

Frequency tables and histograms were the most common univariate methods used. For all statistical investigations, preliminary analyses were performed to ensure that the assumptions of normality, linearity and homoscedasticity were not violated. Any analyses which produced violations of statistical rules were voided; most voided results resulted from incomplete data for specific factors. Bivariate analysis was then used to compare variables and investigate significant relationships. Comprehension of these significant correlations will contribute to our understanding of the relationship between vandalism and the Monument's archaeological sites.

The statistical tests used are objective, in that the results are repeatable; but because characteristics were chosen and measured, the whole analytical process is subjective (Fletcher and Lock 2005). It is critical to remember that a relationship between two variables does not necessarily imply causality; there may be additional factors that influence results (Pallant 2007). During this analysis, if there was a possible third influential factor, that factor was also investigated.

Non-parametric Spearman's rho correlations and the Chi Square Test for Independence were used to explore the relationships between chosen

variables. These techniques were utilized because variables do not need to be manipulated or controlled, and the tests do not make assumptions about the population distribution. Additionally, most data collected at Canyon de Chelly has been measured on nominal and ordinal scales. Chi-square tests were conducted using only two categories in each variable, which produced a 2 by 2 table, therefore Yates' Correction for Continuity correction values were used to compensate for overestimations of the Chi-square values. Relationship strengths indicated by the correlation coefficients (r values) were ranked in strength using Cohen's guidelines (1988, p.79-81, Table 4).

Table 4. Correlation Coefficient Strengths

Strength	r Value
Small	0.10 to 0.29
Medium	0.30 to 0.49
Large	0.50 to 1.0

After Cohen 1988, p.79-81.

Although the GAO report identified incomplete data as a primary reason for not comprehending the looting and defacement problem, this data does exist for the 601 sites in the park database. Site characteristics which have been proven to promote vandalism have been consistently

documented over the last 20 years, and is attributable to the use of well-developed and standardized data collection methods and forms. The methods used in this project have assessed all information relevant to the vandalism issue.

Archaeological professionals have found a large degree of agreement between this type of data and the information gained from looter interviews, supporting the results of these studies (Nickens 1991). Although there are limitations and biases to any dataset, these will be taken into consideration during final analysis. Data analysis will be challenging, but it will add immeasurably to the comprehension of the problem at the canyon, and will allow the formulation of management solutions for its deterrence. Furthermore, data gained in this analysis may also benefit other land-managing agencies in the region.

CHAPTER IV

RESULTS

Current Condition of Park Resources

There are eleven identified culturally-derived agents that affect cultural resources at the Park; neither livestock damage nor inherent construction techniques are malicious in nature (Lyons 2008). The next largest impacts derive from agents caused by illegal activity: unauthorized visitation, defacement and pothunting (Figure 16). Nearly half of the identified sites at Canyon de Chelly are affected by these three agents (Figure 17). These agents are the main focus of this dissertation because they may be diminished with proactive measures. The characteristics that encourage persons to visit, deface and loot sites will be identified using the statistical methods discussed above.

The condition and integrity of each site has been evaluated according to federal and park standards. Condition focuses on a site's physical stability and degree of deterioration, while integrity documents the degree of preservation. When damage from destructive agents is recorded, the

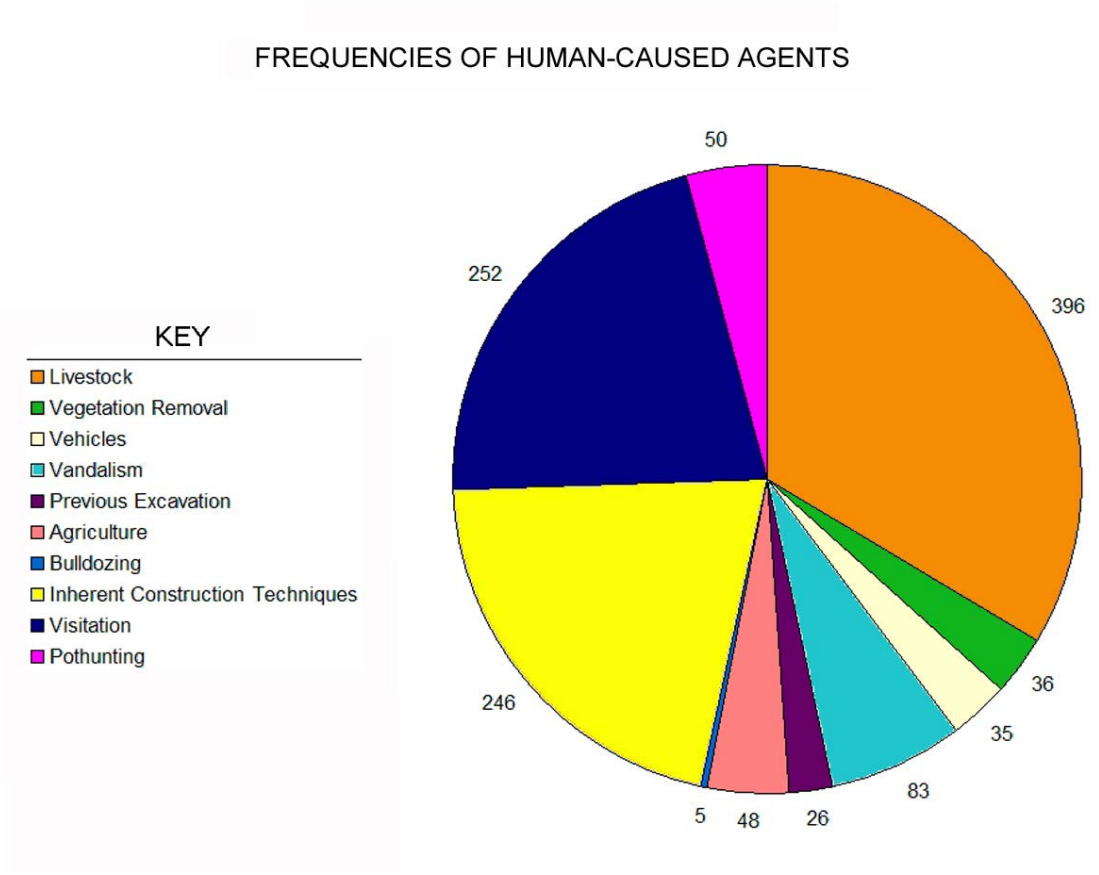

Figure 16. Pie chart showing human-caused agents recorded at Canyon de Chelly National Monument.

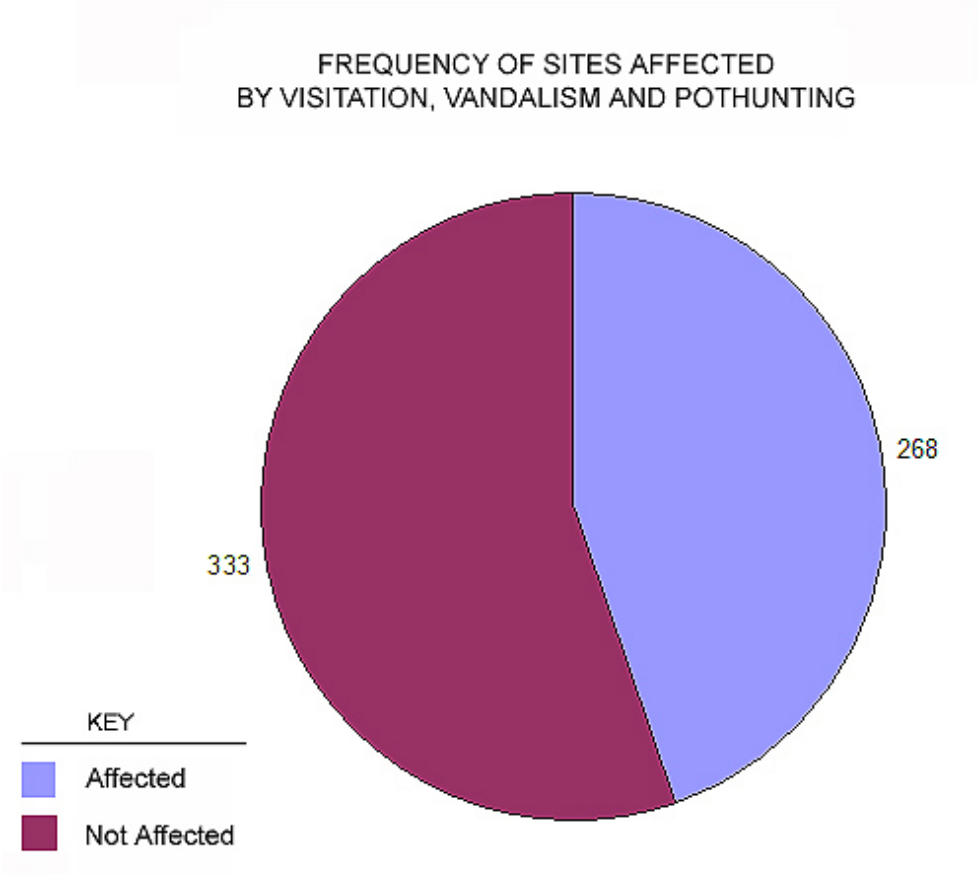

Figure 17. Pie chart showing number of archaeological sites affected by illicit activity.

degree of that damage is assessed according to park standards. Condition values range from "excellent" to "destroyed" and "excellent" to "poor" for integrity (Tables 5, 6). Most sites at the Park are in "Fair" condition while integrity is almost equally split between "Good", "Fair" and "Poor" (Figures 18, 19).

Quantifying existing damage in the canyon reveals that visitation is the most prolific, followed by vandalism then pothunting (Figure 20). The damage from each factor is rated on a standardized scale of severity, divided into four categories (Table 7). Figure 21 illustrates that over half of the damage resulting from the three agents is recorded at a minimal level.

Table 5. Site Condition Definitions

Value	Description
Excellent	The site shows no evidence of noticeable deterioration by natural forces and/or human activities. The site is considered currently stable, and its archaeological values are not threatened. No adjustments to the currently prescribed site treatments are required in the near future to maintain the site's present condition.
Good	The site shows little evidence of noticeable deterioration by natural forces and/or human activities. The site is considered currently stable, and its archaeological values are not greatly threatened. Little to no adjustments to the currently prescribed site treatments are required in the near future to maintain the site's present condition.
Fair	The site shows evidence of deterioration by natural forces and/or human activities. If the identified impacts continue without the appropriate corrective treatment, the site will degrade to a poor condition and the site's data potential for historical or scientific research will be lowered.
Poor	The site shows evidence of severe deterioration by natural forces and/or human activities. If the identified impacts continue without the appropriate corrective treatment, the site is likely to undergo further degradation and the site's data potential for historical or scientific research will be lost.
Destroyed	The site is so severely destroyed or damaged that the data potential and scientific research value was deemed insufficient to warrant further archaeological monitoring or work.

Table 6. Site Integrity Definitions

Value	Description
Excellent	Virtually all archaeological deposits are completely intact and retain all of their original archaeological integrity. Preservation is exceptional and all indications are that the archaeological deposits are entirely in situ and unaltered.
Good	The archaeological deposits have suffered some minor degradation as a result of natural forces and/or human activities, but this has not appreciably reduced the overall integrity of the extant archaeological deposits. The existing deposits are mostly intact and complete
Fair	The archaeological deposits have clearly suffered as a result of natural forces and/or human activities, and a majority has been compromised. Despite the loss, a sizeable portion of the remaining deposits are relatively intact and complete.
Poor	The greater majority of archaeological deposits have been severely disturbed by natural and/or human forces, but a small portion remains relatively intact.

Table 7. Severity Impact Definitions

Rate	Definition
Absent	0% of site impacted
Minimum	1 - 30% of site impacted
Moderate	31 - 70% of site impacted
Severe	71-100% of site impacted

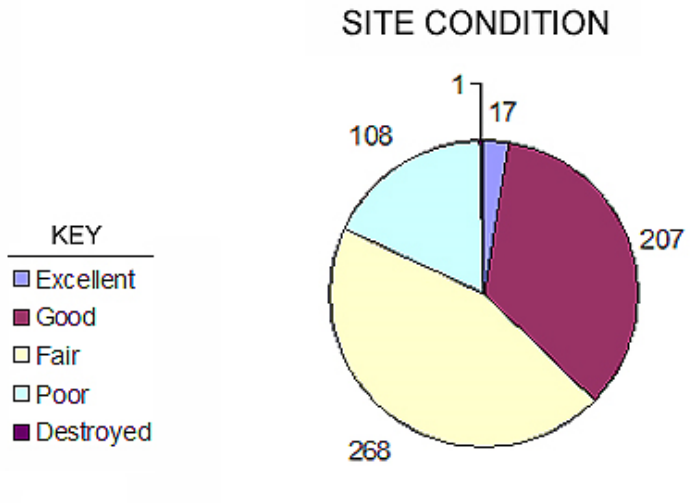

Figure 18. Pie chart showing frequency of site condition.

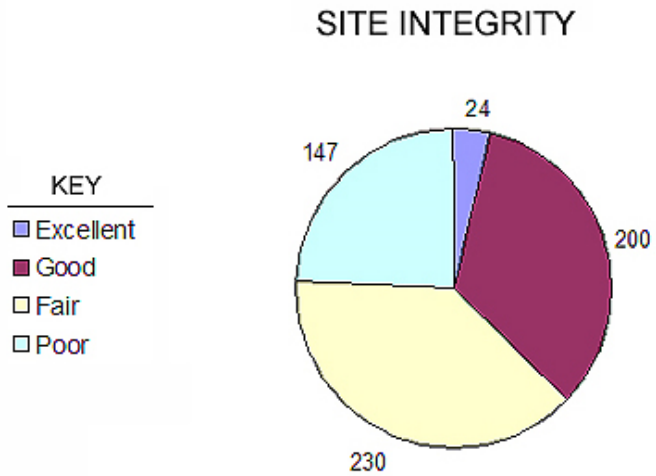

Figure 19. Pie chart showing frequency of site integrity.

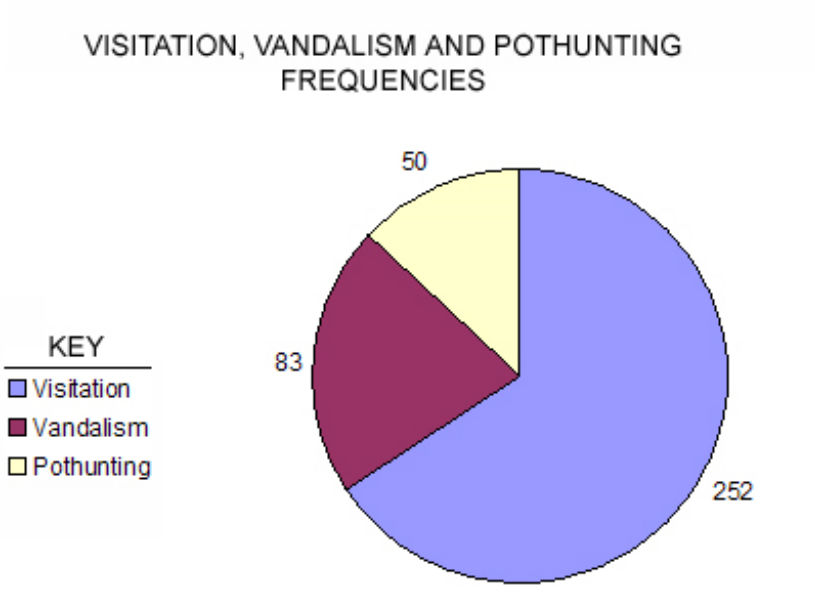

Figure 20. Pie chart showing instances of visitation, vandalism and pothunting.

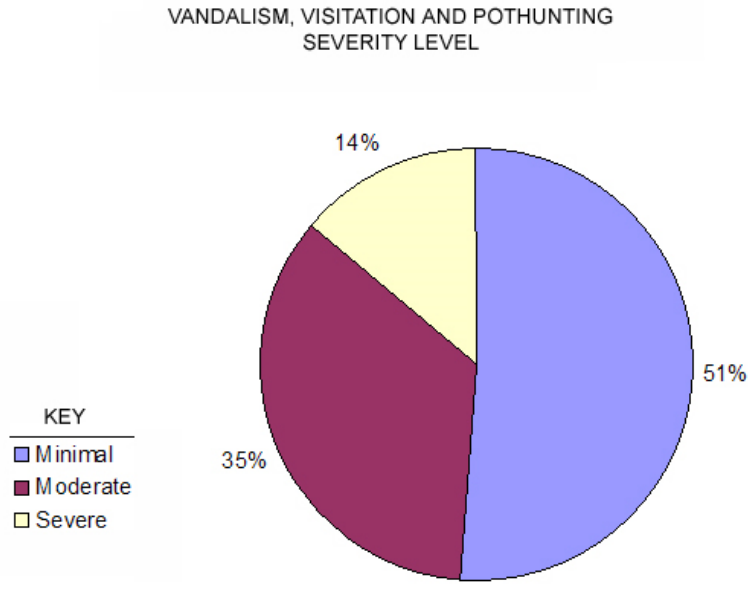

Figure 21. Damage severity level for visitation, vandalism and pothunting.

The Most Affected Sites

To identify the sites that have been the most impacted by visitation, vandalism and pothunting, the severity rate of impairments were multiplied by an integer that represents the magnitude of each factor. For instance, visitation damage, which is usually incidental, was deemed as the least serious impairment, and so was given a multiplication factor of 1. Pothunting which is the most malicious in nature, was multiplied by a factor of 3, while vandalism was multiplied by a factor of 2. The site's overall damage rank was calculated by adding the total for each factor; these totals ranged from 0 to 18.

This formula was applied to all 601 sites; the results of this calculation were added to describe the current level of impacts visible at each site. Luckily, 83% of sites with visitation damage fall under the "Low Impact" category, while only 4% are highly affected (Figure 22); this low rate of damage is encouraging, and conveys the quality of archaeological preservation at the monument. The results from this ranking may be used to prioritize sites in the high impact category for additional protective measures.

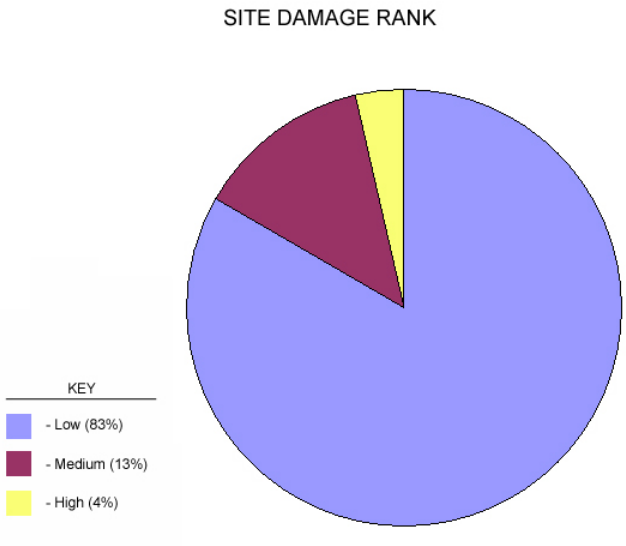

Figure 22. Damage rank for affected sites.

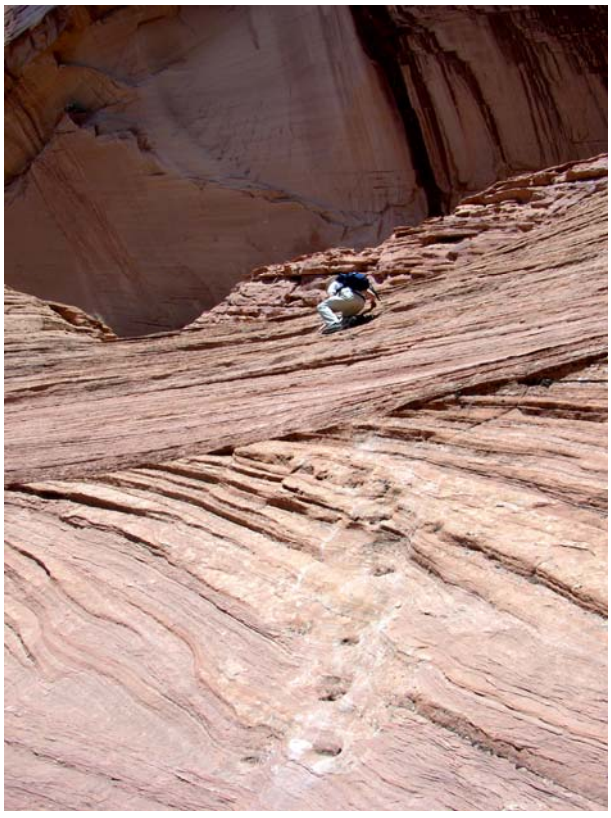

Figure 23. An archaeologist makes a difficult climb to a site using a prehistoric hand and toe-hold trail.

Factors Which Encourage Vandalism

Site Specific Factors

Accessibility

Site accessibility is defined as the physical ease of reaching a site. In other areas this is measured by the distance from paved roads, but at Canyon de Chelly it encompasses other factors. Accessibility at the Park considers not only the distance from primary thoroughfares, but the difficulty of the hike to the site and if necessary, the skill level needed to climb to the site (Figure 23). The five categories of accessibility have been defined in Table 8 while their frequencies are presented in Table 9; this demonstrates that the majority of the sites at the Park are easily accessible.

Table 8. Accessibility Rank Definitions

Value	Definition
Easy	The site can be easily reached by anyone, regardless of the distance from a road or trail, or the person's technical ability. Most canyon bottom sites will fall into this category.
Moderately Difficult	The site is located on a steep section of talus or slickrock, and requires a moderate degree of concentration, technical skill and planning before accessing.
Difficult	The site is located on a steep, almost vertical section of talus or slickrock and requires a considerable degree of concentration, technical skill and planning before accessing.
Inaccessible without Technical Gear	Accessing the site is impossible without technical climbing gear and advanced knowledge.

Table 9. Accessibility Rank and Damage Frequencies

	Inaccessible without Technical Gear	Difficult	Moderately Difficult	Easy	TOTAL
Pothunting	1	11	15	23	50
Vandalism	2	8	21	52	83
Visitation	5	30	72	145	252
TOTAL	8	49	108	220	

Spearman's rho correlation analysis was employed to examine the relationship between accessibility rank and the presence of vandalism damage. There was a small significant correlation between the ease of access and vandalism and visitation, and none with pothunting (Table 10). Therefore visitation and vandalism damage is related to easier accessibility. Spearman's rho analysis was used to examine damage severity; there was a small, significant negative correlation with visitation (Table 11). This suggests that the more difficult it is to access an archaeological site, the less severe damage from visitation will be.

Table 10. Presence of Damage and Accessibility Rank

	Spearman's rho Correlation Coefficient	Coefficient of Determination (Shared Variance)	Significance Level (Confidence)
Pothunting	-0.02	0%	0.56
Vandalism	**0.11**	**1%**	**0.01**
Visitation	**0.15**	**2%**	**0.00**

Table 11. Damage Severity Rank and Accessibility Rank

	Spearman's rho Correlation Coefficient	Coefficient of Determination (Shared Variance)	Significance Level (Confidence)
Pothunting	-0.09	1%	0.52
Vandalism	0.04	12%	0.76
Visitation	**-0.13**	**2%**	**0.04**

Visibility

Visibility is characterized as how simple it is to visually locate an archaeological site, what Williams calls, "eye appeal" (1978). This ranking takes into account a site's visual prominence from canyon access methods. Sites with surface features such as rock art and architecture, or which are located in expansive alcoves are usually more visible than those comprised

of an artifact scatter. Visibility rates may alter through time due to vegetation changes, but this is kept in mind. The visibility of the site and its area is gauged relative to similar sites. Table 12 illustrates that the majority of the canyon's sites are easily visible from roads or with an easy or short hike from a road.

Table 12. Visibility Rank and Damage Frequencies

	Visible from Road	Visible from Trail	Visible with Easy or Short Hike from Road Trail	Visible with Moderately Difficult Hike from Road Trail	Visible with Difficult Hike from Road/Trail	TOTAL
Pothunting	22	5	10	10	3	50
Vandalism	41	5	29	7	1	83
Visitation	102	19	92	35	4	252
TOTAL	165	29	131	52	8	

When Spearman's rho correlations between the ease of visibility and the presence and intensity of damage were explored, only vandalism and visitation damage related significantly to visibility. The presence of graffiti damage shared a small positive correlation; meaning that as sites become less visible, defacement ceases (Table 13). This is reminiscent of vandalistic behavior elsewhere; the prominence of the graffiti is important to its creator. When examining damage severity rates, there was a significant association with only visitation (Table 14). The less visible a site, the less intense

damage from visitation will be. This suggests that the sites that are the most impaired by visitation damage are those that are the most visible. Therefore, the visibility of a site is related to the presence of vandalism and visitation damage and higher visibility is related to more severe visitation damage. Visibility has no relationship to either the presence or rate of looting damage.

Table 13. Presence of Damage and Visibility Rank

	Spearman's rho Correlation Coefficient	Coefficient of Determination (Shared Variance)	Significance Level (Confidence)
Pothunting	0.01	0%	0.87
Vandalism	**0.10**	**1%**	**0.02**
Visitation	0.05	0.2%	0.24

Table 14. Damage Severity Rank and Visibility Rank

	Spearman's rho Correlation Coefficient	Coefficient of Determination (Shared Variance)	Significance Level (Confidence)
Pothunting	0.00	0%	1.00
Vandalism	-0.14	2%	0.21
Visitation	**-0.12**	**1%**	**0.05**

Previous Documentation

Many sites in the park have been well-known since exploration began in the late 1800s. When systematic inventory was begun by the APP, information was compiled regarding the previous documentation of each site. Historically prominent sites might be more at risk for damage from the three agents. To see if a relationship exists between prior investigation and the presence of damage, Pearson's Chi-Square analysis was completed. Analysis demonstrated significant correlations with all three factors (Table 15).

Table 15. Damage Severity Rank and Previously Documented Sites

	Spearman's rho Correlation Coefficient	Coefficient of Determination (Shared Variance)	Significance Level (Confidence)
Pothunting	**0.22**	**5%**	**0.00**
Vandalism	**0.25**	**6%**	**0.00**
Visitation	**0.29**	**8%**	**0.00**

Site Size

Site size at Canyon de Chelly ranges from very small ($3m^2$) to extremely large ($89{,}629m^2$). Larger sites may be more prominent and therefore more at risk for damage from visitation, vandalism and pothunting. The three factors were equally divided into four size categories

to facilitate analysis. Spearman's rho analysis verified that larger site size is related to the presence of all three types of damage (Table 16). Despite this, site size does not play a role in determining the severity of damage (Table 17). Obviously, larger sites are enticing people to visit, but size does not dictate the amount of damage a site will receive.

Table 16. Presence of Damage and Site Size Rank

	Spearman's rho Correlation Coefficient	Coefficient of Determination (Shared Variance)	Significance Level (Confidence)
Pothunting	**0.28**	**8%**	**0.00**
Vandalism	**0.17**	**3%**	**0.00**
Visitation	**0.22**	**5%**	**0.00**

Table 17. Damage Severity Rank and Site Size Rank

	Spearman's rho Correlation Coefficient	Coefficient of Determination (Shared Variance)	Significance Level (Confidence)
Pothunting	0.23	5%	0.10
Vandalism	-0.04	0.2%	0.70
Visitation	0.06	0.4%	0.31

Research Potential

Archaeologists describe research potential as the promise a site holds in adding information to an existing knowledge base, or in answering research questions. Sites may possess research potential regardless of their size or prominence; even seemingly insignificant sites, when studied in the proper context, may hold the answer to questions that have beleaguered scholars for generations. Despite this, there are sites which are deemed to have no potential; these typically have had their condition and integrity extremely compromised by destructive forces.

Research potential at Canyon de Chelly is determined by comparing each site relative to others in the database, and evaluating potential in the following areas: subsistence, architecture, chronology, settlement organization, resource use, technology, population, material culture, artistic concepts, trade, technology, material culture, warfare and defense, ideology and abandonment.

Chi-Square analysis was used to determine if visitors and vandals consider potential when targeting a site. There was a small correlation between research potential and the presence of incidental damage from

visitation, but none with pothunting or vandalism (Table 18). Consequently, it appears that visitors may be attracted to the same sites that archaeologists perceive as having research potential, but that looters and vandals are drawn to sites regardless of that potential.

Table 18. Presence of Damage and Research Potential

	Pearson's Chi-Square (with Yates' Continuity Correction)	p Value (Significance Level with Yates' Continuity Correction)	phi Coefficient (Effect Size)	Crosstabulation (Percent of Sites Pothunted with Research Potential)
Pothunting	3.06	0.08	0.08	98%
Vandalism	2.36	0.12	0.07	95%
Visitation	**7.61**	**0.01**	**0.12**	**94%**

Chronological Affiliation

Many authors have suggested the chronological association of archaeological sites as a primary factor in visitation and pothunting (Nickens et al. 1981, Nickens 1991, Christensen et al. 1996). Statistical analysis was completed to test this suggestion. It is theorized that Basketmaker and prehistoric Pueblo sites will have the most damage from visitation and pothunting because of the historical interest in these periods, while vandalism may affect sites of any era.

Chronological component frequencies demonstrate that prehistoric Pueblo and historic Navajo sites comprise the majority of recorded components (Figure 24). It must be remembered that many sites have more than one chronological affiliation, and that this may skew the results. To remove this bias, single chronological component sites were also analyzed.

Preliminary results show that Euro-American components figure prominently in the presence of damage from each factor (Figure 25). This could be attributable to an error in recording methods; if visitation damage and defacement by non-native visitors is recorded as a chronological component, it would produce the higher rates. This must be remembered during further analysis using the total site population.

Visitation:

When the presence of visitation damage at all sites is investigated statistically using Pearson's Chi-Square analysis, there are significant small-strength relationships with Archaic, historic Pueblo, historic and recent Navajo and historic Euro-American time period classifications (Table 19). When the same analyses are completed with data from single-component

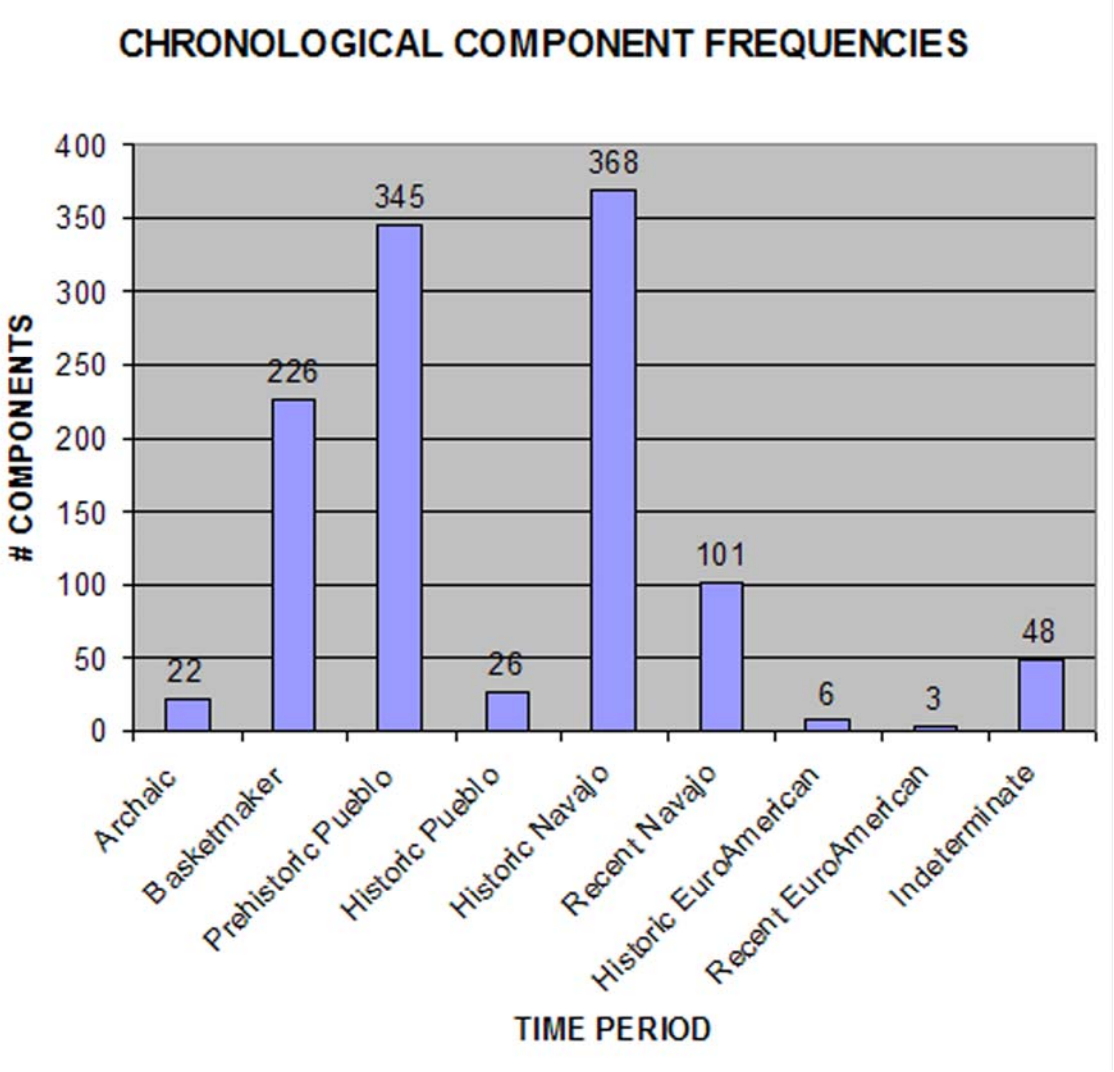

Figure 24. Bar graph showing frequency of chronological components.

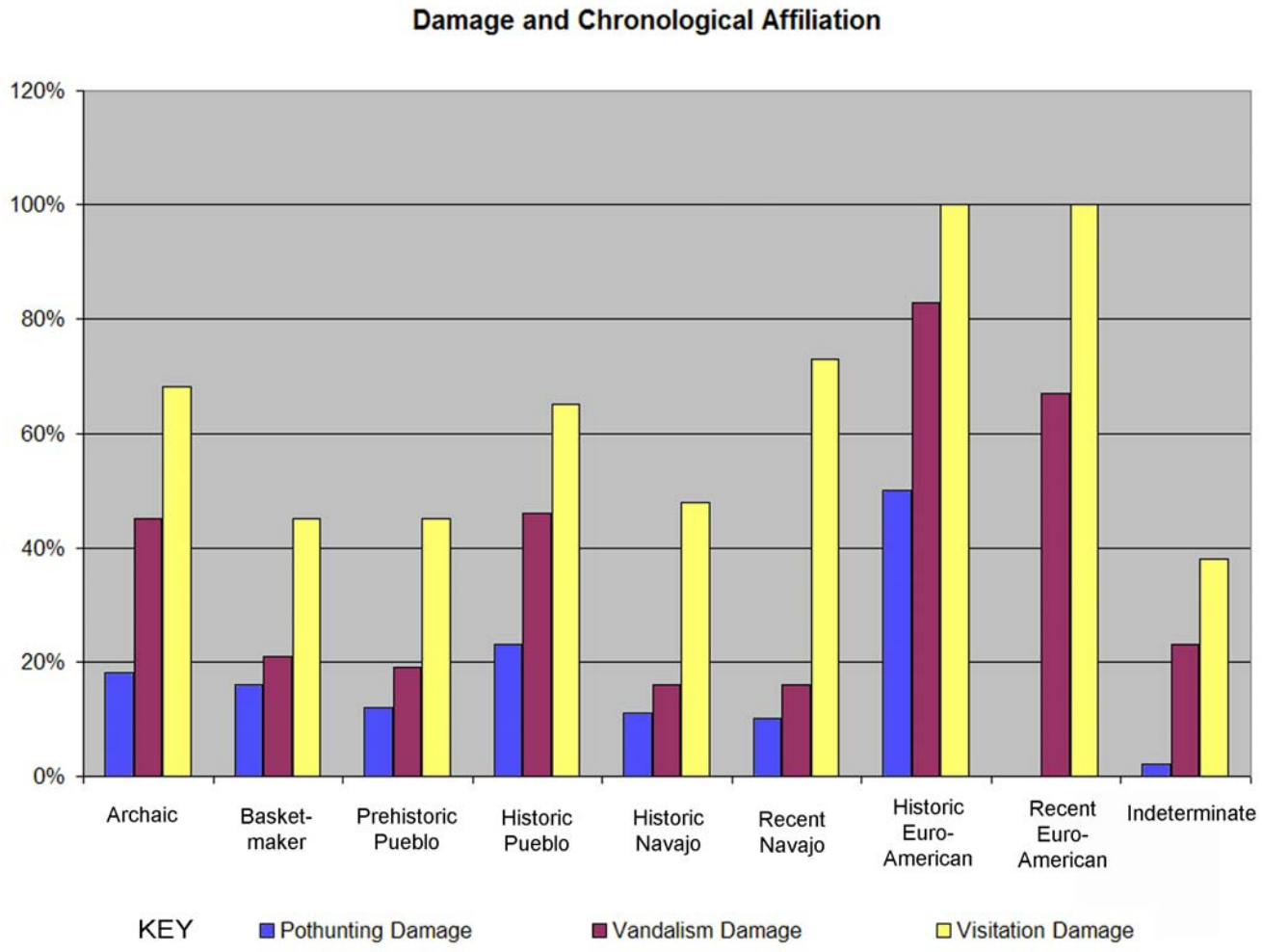

Figure 25. Damages by chronological component.

sites, there was a significant correlation between visitation and historic Navajo sites (Table 20). Unfortunately a lack of data for single-component sites prevents analysis by each chronological period. As more single-component sites are recorded, additional analysis should be completed.

Table 19. Visitation Damage and Chronological Components

	Pearson's Chi-Square (with Yates' Continuity Correction)	p Value (Significance Level with Yates' Continuity Correction)	phi Coefficient (Effect Size)	Crosstabulation (Percent of Sites Vandalized within Time Period)
Archaic	**5.39**	**0.02**	**0.10**	**68%**
Basketmaker	1.32	0.25	0.05	45%
Prehistoric Pueblo	2.71	0.10	0.07	45%
Historic Pueblo	**6.14**	**0.01**	**0.10**	**65%**
Historic Navajo	**14.18**	**0.00**	**0.16**	**48%**
Recent Navajo	**47.43**	**0.00**	**0.29**	**73%**
Historic EuroAmerican	**6.16**	**0.01**	**0.12**	**100%**
Recent EuroAmerican	VOID	VOID	VOID	VOID
Indeterminate	VOID	VOID	VOID	VOID

Table 20. Visitation Damage and Single-Chronological Component Sites

	Pearson's Chi-Square (with Yates' Continuity Correction)	p Value (Significance Level with Yates' Continuity Correction)	phi Coefficient (Effect Size)	Crosstabulation (Percent of Sites with Visitation Damage within Chronological Period)
Archaic	VOID	VOID	VOID	VOID
Basketmaker	1.02	0.31	-0.06	49%
Prehistoric Pueblo	0.02	0.90	-0.01	51%
Historic Pueblo	VOID	VOID	VOID	VOID
Historic Navajo	**6.28**	**0.01**	**0.14**	**55%**
Recent Navajo	VOID	VOID	VOID	VOID
Historic Euro-American	VOID	VOID	VOID	VOID
Recent Euro-American	VOID	VOID	VOID	VOID
Indeterminate	0.30	0.58	-0.04	45%

Vandalism:

When Pearson's Chi-Square analysis was completed using all chronological components, Basketmaker, prehistoric Pueblo, and historic and recent Navajo periods had significant relationships with the presence of vandalism (Table 21). When the data for single-component sites were subjected to the same test, only Basketmaker sites had a significant correlation with vandalism (Table 22).

Table 21. Vandalism Damage and Chronological Components

	Pearson's Chi-Square (with Yates' Continuity Correction)	p Value (Significance Level with Yates' Continuity Correction)	phi Coefficient (Effect Size)	Crosstabulation (Percent of Sites Vandalized within Time Period)
Archaic	VOID	VOID	VOID	VOID
Basketmaker	**13.93**	**0.00**	**0.16**	**16%**
Prehistoric Pueblo	**16.24**	**0.00**	**0.17**	**19%**
Historic Pueblo	VOID	VOID	VOID	VOID
Historic Navajo	**8.98**	**0.00**	**0.13**	**11%**
Recent Navajo	**21.65**	**0.00**	**0.19**	**29%**
Historic EuroAmerican	VOID	VOID	VOID	VOID
Recent EuroAmerican	VOID	VOID	VOID	VOID
Indeterminate	VOID	VOID	VOID	VOID

Table 22. Vandalism Damage and Single-Chronological Component Sites

	Pearson's Chi-Square (with Yates' Continuity Correction)	p Value (Significance Level with Yates' Continuity Correction)	phi Coefficient (Effect Size)	Crosstabulation (Percent of Sites Vandalized within Chronological Component)
Archaic	VOID	VOID	VOID	VOID
Basketmaker	**3.84**	**0.05**	**0.11**	**25%**
Prehistoric Pueblo	3.20	0.07	0.10	23%
Historic Pueblo	VOID	VOID	VOID	VOID
Historic Navajo	0.04	0.85	0.02	21%
Recent Navajo	VOID	VOID	VOID	VOID
Historic Euro-American	VOID	VOID	VOID	VOID
Recent Euro-American	VOID	VOID	VOID	VOID
Indeterminate	1.55	0.21	0.08	31%

Pothunting:

Examining the relationship between time periods and the presence of pothunting damage produced significant results with Basketmaker, prehistoric Pueblo, historic and recent Navajo, and historic Euro-American components (Table 23). Examining single-component sites produced significant correlations with Basketmaker and prehistoric Pueblo sites (Table 24).

Table 23. Pothunting Damage and Chronological Components

	Pearson's Chi-Square (with Yates' Continuity Correction)	p Value (Significance Level with Yates' Continuity Correction)	phi Coefficient (Effect Size)	Crosstabulation (Percent of Sites Vandalized within Time Period)
Archaic	VOID	VOID	VOID	VOID
Basketmaker	**25.92**	**0.00**	**0.21**	**16%**
Prehistoric Pueblo	**12.42**	**0.00**	**0.15**	**12%**
Historic Pueblo	VOID	VOID	VOID	VOID
Historic Navajo	**8.98**	**0.00**	**0.13**	**11%**
Recent Navajo	**47.43**	**0.00**	**0.29**	**73%**
Historic EuroAmerican	**8.84**	**0.00**	**0.15**	**50%**
Recent EuroAmerican	VOID	VOID	VOID	VOID
Indeterminate	VOID	VOID	VOID	VOID

Table 24. Pothunting Damage and Single-Chronological Component Sites

	Pearson's Chi-Square (with Yates' Continuity Correction)	p Value (Significance Level with Yates' Continuity Correction)	phi Coefficient (Effect Size)	Crosstabulation (Percent of Sites Pothunted within Chronological Component)
Archaic	VOID	VOID	VOID	VOID
Basketmaker	**8.21**	**0.00**	**0.16**	**18%**
Prehistoric Pueblo	**8.64**	**0.00**	**0.17**	**16%**
Historic Pueblo	VOID	VOID	VOID	VOID
Historic Navajo	2.31	0.13	0.09	14%
Recent Navajo	VOID	VOID	VOID	VOID
Historic Euro-American	VOID	VOID	VOID	VOID
Recent Euro-American	VOID	VOID	VOID	VOID
Indeterminate	1.60	0.21	-0.08	3%

Physical Components

Features at prehistoric and historic sites may be classified into four categories: architectural, non-architectural, rock art and human remains. Examples of commonly found feature types may be found in Table 25. It is theorized that the presence of certain components will be correlated with visitation, vandalism and looting damage.

Table 25. Common Site Physical Components at Canyon de Chelly

	Prehistoric	Historic
Architectural	Storage Units, Pithouses, Roomblock, Kiva, Towers, Intramural Hearths, Retaining Wall, Floors, Benches, Post holes, Beam sockets, (BM-PIII), Hunting Blind, Plaza, plastered surfaces, Mud lines, roof materials	Hogans, Granary, Sweat Lodge, Enclosed Niche, Pueblito, Defensive Wall, Hunting Blind, Camping Circle, Hearth, Oven, Storage Structure, Shade Structure, Cabin, Field House
Non-Architectural	Check Dam, Kiln, Hand and Toe Hold Trail, Grinding Slicks, Sharpening Grooves, Pit, Extramural Hearths, Pecked Cupules, Water Control Features, Rock Piles, Water Catchment, Fire Blackening	Ritual Cairn, Dam, Irrigation Ditch, Earthen Berm, Grinding Slick, Hand And Toe Holds, Rock Pile, Rock Cairn, Water Catchment, Slide, Extramural Hearth, Fire Pit, Roasting Pit, Orchard, Agricultural Field, Corral, Fence
Rock Art	Pictographs, Petroglyphs, Rock Art Panel, Single Rock Art Element	Pictographs, Petroglyphs, Commemorative Panel, Planetarium, Rock Art Panel, Single Rock Art Element, Graffiti
Human Remains	Inhumation, Cremation, Architectural Burial in storage unit, Architectural Burial in room block, Midden Burial	Storage Unit Burial, Rock Pile Burial, Room block Burial, Hogan Burial, Crevice Burial, Cliff Face Burial

Visitation:

There was a significant relationship between rock art, human remains and visitation damage at prehistoric sites, and between architecture and non-architectural components at historic sites (Table 26).

Table 26. Presence of Visitation Damage and Site Physical Components

	Pearson's Chi-Square (with Yates' Continuity Correction)	p Value (Significance Level with Yates' Continuity Correction)	phi Coefficient (Effect Size)
PREHISTORIC COMPONENTS			
Architectural	0.61	0.43	0.04
Non-Architectural	0.99	0.32	0.04
Rock Art	**12.68**	**0.00**	**0.15**
Human Remains	**12.30**	**0.00**	**0.15**
HISTORIC COMPONENTS			
Architectural	**8.93**	**0.00**	**0.13**
Non-Architectural	**10.57**	**0.00**	**0.14**
Rock Art	2.94	0.09	0.07
Human Remains	1.09	0.30	0.05

Vandalism:

There were significant relationships between all prehistoric site components and defacement, and upon closer examination the presence of rock art exhibits the strongest correlation to vandalism (Table 27). Only rock art was significantly correlated with vandalism and historic components. It appears that rock art is the primary factor in the relationship between vandalism and physical components.

Table 27. Presence of Vandalism Damage and Site Physical Components

	Pearson's Chi-Square (with Yates' Continuity Correction)	p Value (Significance Level with Yates' Continuity Correction)	phi Coefficient (Effect Size)
PREHISTORIC COMPONENTS			
Architectural	**4.36**	**0.04**	**0.09**
Non-Architectural	**7.80**	**0.01**	**0.12**
Rock Art	**73.41**	**0.00**	**0.35**
Human Remains	**11.35**	**0.00**	**0.15**
HISTORIC COMPONENTS			
Architectural	0.17	0.68	0.02
Non-Architectural	0.01	0.92	-0.01
Rock Art	**18.55**	**0.00**	**0.18**
Human Remains	0.00	1.00	0.00

Pothunting:

Prehistoric and historic architectural, non-architectural and rock art components were significantly correlated with looting (Table 28). Data was too scant to perform correlations between the presence of human remains and pothunting, but it can be postulated that this would be an aspect in choosing a site for looting since burial objects are usually intact and fetch higher prices.

Table 28. Presence of Pothunting Damage and Site Physical Components

	Pearson's Chi-Square (with Yates' Continuity Correction)	p Value (Significance Level with Yates' Continuity Correction)	phi Coefficient (Effect Size)
PREHISTORIC COMPONENTS			
Architectural	**28.45**	**0.00**	**0.22**
Non-Architectural	**21.64**	**0.00**	**0.20**
Rock Art	**35.74**	**0.00**	**0.25**
Human Remains	VOID	VOID	VOID
HISTORIC COMPONENTS			
Architectural	**6.53**	**0.01**	**0.11**
Non-Architectural	**4.97**	**0.03**	**0.10**
Rock Art	**5.44**	**0.02**	**0.10**
Human Remains	VOID	VOID	VOID

Site Density

Areas with denser concentrations of resources have been identified as increasing the potential of predatory vandalism damage. At Canyon de Chelly, it is theorized that site density might also encourage visitation. To see if this is true, site densities were calculated for the eight management sectors in Canyon del Muerto. A Geographic Information System (GIS) was employed to calculate the area of each sector, and then the number of sites in each sector was tallied. An average density per kilometer was calculated; this is found in Table 29 and represented visually in Figure 26. It's obvious

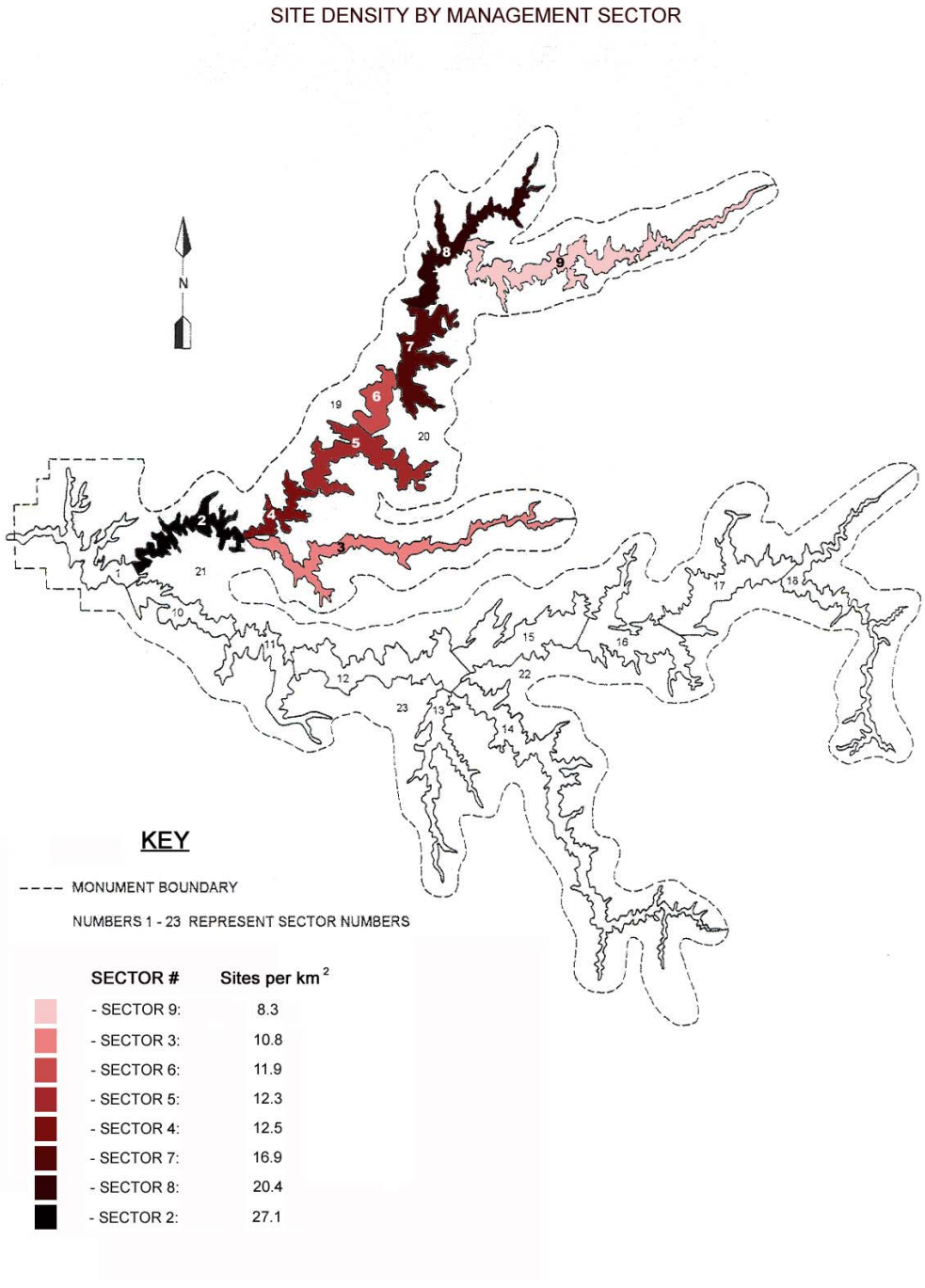

Figure 26. Park Management Sector map showing density of sites per kilometer.

that the densest area of sites exists at the entrance of Canyon del Muerto, which is also an easily accessible location.

Table 29. Site Density by Management Sector
Canyon Del Muerto

Sector	Total km^2	Total # Sites	Site Density (# Sites per km^2)
2	3.496	95	27.1
3	6.086	66	10.8
4	2.394	30	12.5
5	6.138	75	12.3
6	2.641	31	11.9
7	5.430	91	16.9
8	4.626	94	20.4
9	8.140	67	8.3

The sector density ranking and presence of damage was explored with Spearman's rho calculations. There were significant, small-strength correlations with the presence of both pothunting and defacement; the sectors with higher densities of sites experience more of these types of malicious vandalism than less dense sectors (Table 30). No significant correlation existed between density and the presence of visitation damage. Damage severity ranks were also analyzed and there were no significant

correlations, therefore sector density appears to play no role in the amount of damage seen at archaeological sites (Table 31).

Table 30. Presence of Damage and Site Density Rank

	Spearman's rho Correlation Coefficient	Coefficient of Determination (Shared Variance)	Significance Level (Confidence)
Pothunting	**-0.09**	**0.9%**	**0.03**
Vandalism	**-0.14**	**2.1%**	**0.00**
Visitation	-0.02	4.0%	0.65

Table 31. Damage Severity Rank and Site Density Rank

	Spearman's rho Correlation Coefficient	Coefficient of Determination (Shared Variance)	Significance Level (Confidence)
Pothunting	0.01	0.0%	0.97
Vandalism	-0.21	4.3%	0.18
Visitation	-0.01	0.0%	0.85

Regional Factors

Regional factors which increase the potential of damage are difficult to analyze statistically because some data is scant, while others cannot be quantified and cross-tabulated with the Canyon's data. Despite this, trends may be explored and compared with general vandalism rates. Any regional factor may independently encourage vandalism, and unfortunately, Canyon de Chelly has to struggle with dangerous trends in nearly all of these areas.

Guardianship

Looters and vandals tend to target resources where they have the least chance of being apprehended (Nickens 1991, Lane et al. 2008, Bundy 2008). Consequently, they choose resources in areas missing strong social control. Canyon de Chelly has a staff of 22-25 people per year, of which approximately half are field-based. Three law enforcement officers, four archaeologists, two interpretive rangers and five natural resource technicians regularly show presence in the park. Although we cannot statistically investigate the affect ranger presence (or lack thereof) has on the Park's resources, we can calculate the ratio of rangers to acres and per capita.

The amount of acreage that each ranger needs to patrol is staggering and literally impossible, and the per capita rate of law enforcement officers to the local population is equally overwhelming (Table 32). Consistent ranger presence is lacking; there are numerous sites that are readily accessible and predominantly unguarded.

Table 32. Ranger Presence

# NPS Personnel	Park Acreage	Per Capita Patrol Acreage	Local Population* (Chinle)	Ranger to Resident Ratio
14	83,840	5988	5,366	1 to 447

*From Choudhary 2000

Socioeconomic Conditions

The Park's immediate region battles poverty rates more than three times and unemployment rates four times the national average (Figures 27), 28). Despite these dismal numbers, the rate of serious crimes such as murder, rape, robbery, and assault is quite low compared to the surrounding area and state averages (Figure 29). Whether this is due to genuinely less delinquency, a lack of law enforcement personnel, or the remoteness of the area is unknown; however high poverty and unemployment rates are usually correlated to higher crime rates.

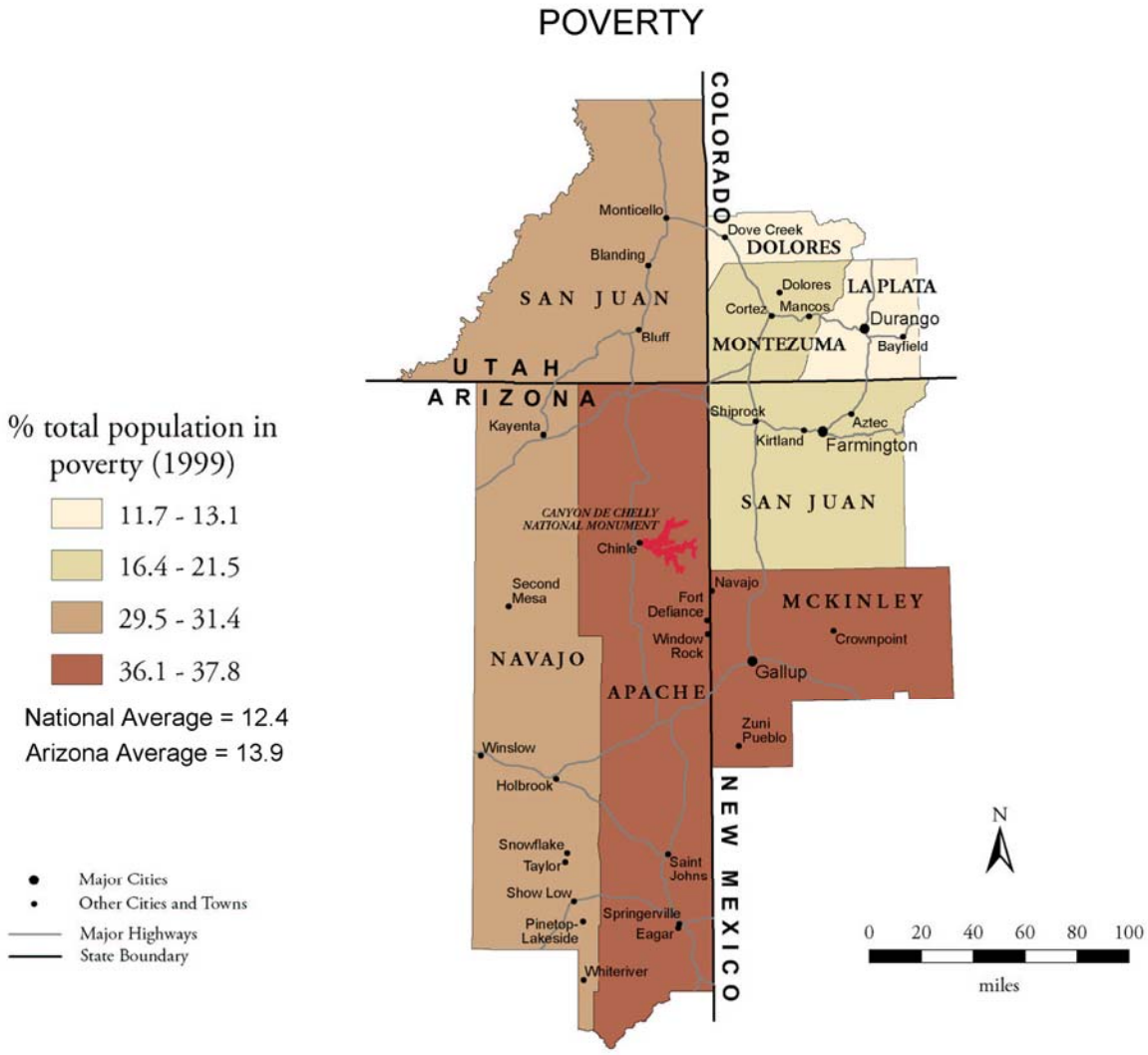

Figure 27. Regional poverty level. (After McKendry et al. 2004, p.37).

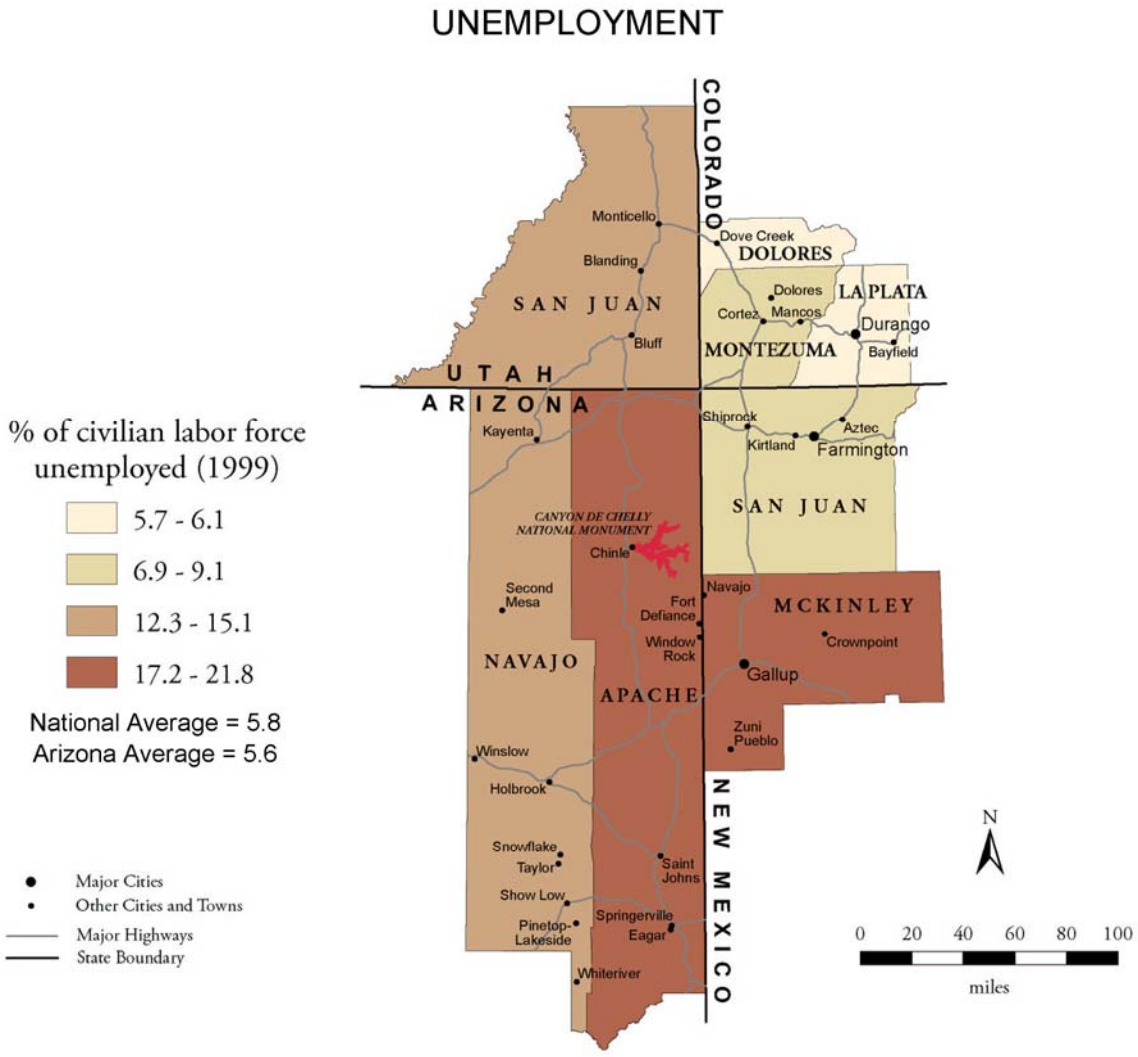

Figure 28. Regional unemployment rate. (After McKendry et al. 2004, p.39).

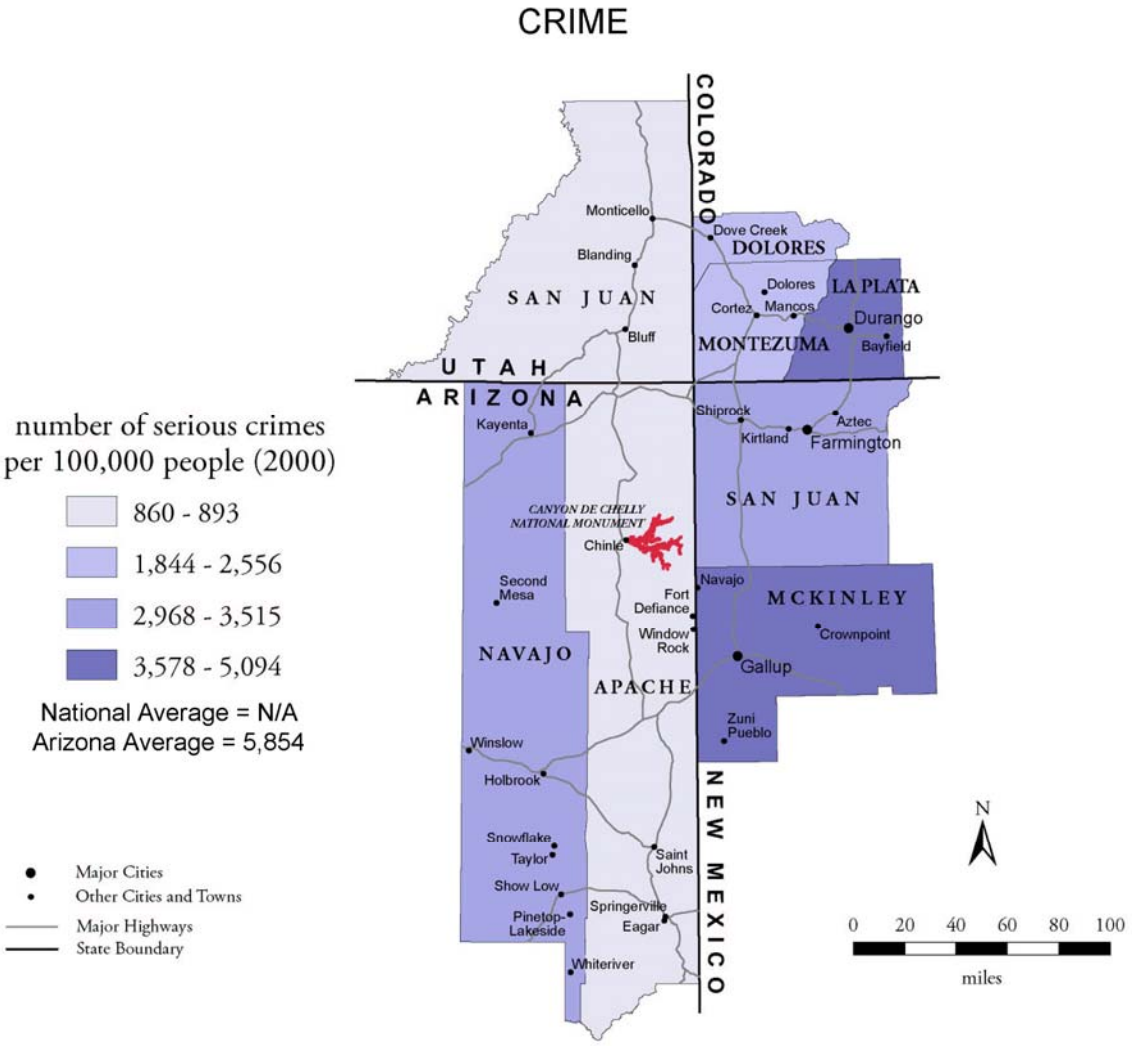

Figure 29. Crime rate regional map. (After McKendry et al. 2004, p.49).

An even bleaker socioeconomic picture emerges when comparing local Chinle data to Navajo Nation and 2000 U.S. Census Data (Choudhary 2000). The local community's income and educational attainment is well below the national and Navajo Nation averages, while the unemployment rate is much higher (Table 33). Regional median household income is little more than half of the national average (Figure 30), while less than 35% of the population has attended college (Figure 31).

Table 33. Income, Unemployment and Education

	U.S. Average	Navajo Nation Tribal Member Average	Chinle Chapter Average
Per Capita Income	$21,587	$6,807	$6,685
Unemployment Rate	4%	50%	65%
High School Completion	80%	54%	47%

Source: Choudhary, *Navajo Nation Data from U.S. Census 2000*, Division of Economic Development (The Navajo Nation), p.23-56.

Poor economic conditions in the late 19th century and again in the 1930s encouraged two of the most serious looting epidemics in U.S. history (Nickens 1991, Bundy 2008). The unemployment rate of the Great Depression was less than half that of Chinle's today, and buyers were not

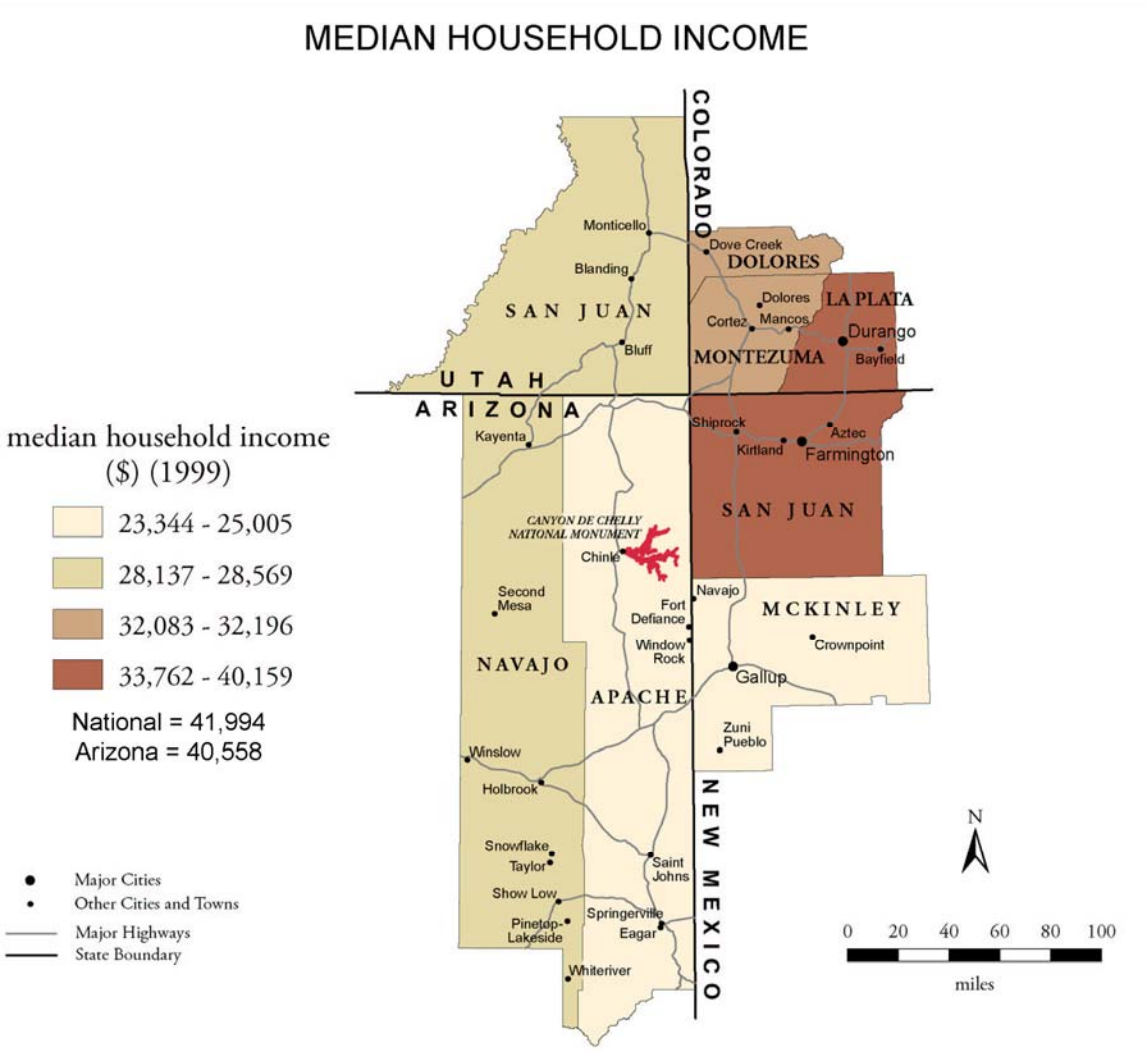

Figure 30. Median household income regional map. (After McKendry et al. 2004, p.41).

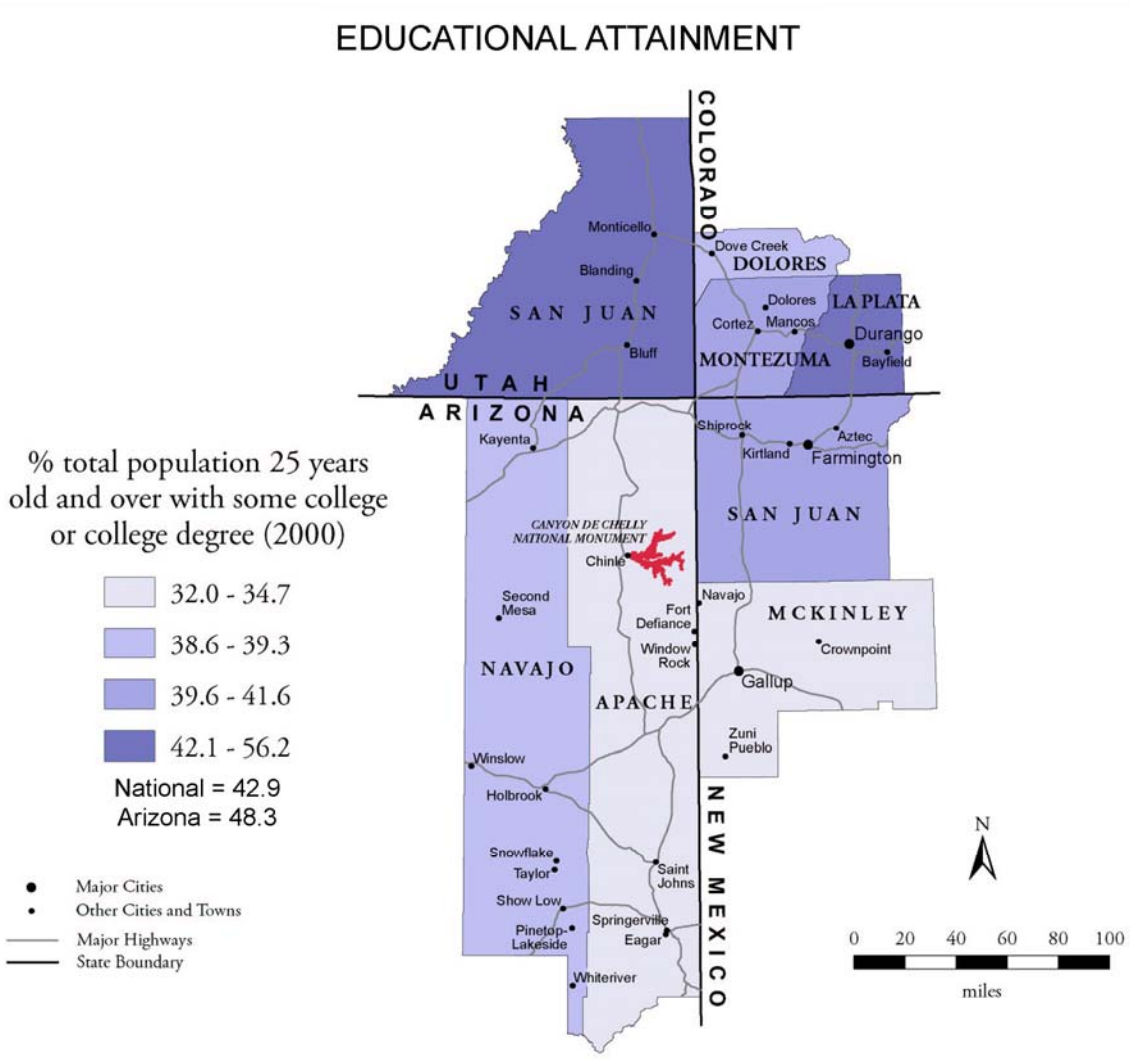

Figure 31. Regional educational attainment. (After McKendry et al. 2004, p.45).

hard to find in those times, even before the advent of the internet and online auctions. Additionally, wealth disparity between the Navajo Nation and the U.S. automatically creates a market dynamic which may increase the chance of commercial looting (Lane et al. 2008). The current weakening national economic condition will likely depress the Navajo economy further, and increase the likelihood of crimes to supplement income.

Public Opinion

Data pertaining to the attitudes of local people regarding cultural resources and those who study and protect them is not available; this is unfortunate, because analysis of this information may be critical in understanding why damage occurs in the park. Several studies have examined general public opinions in areas where there is an extensive history of artifact collection, and where contentious relationships exist between land-managing agencies and local people (Nickens 1991, Pokotylo and Mason 2000, SAA 2000, Bundy 2008). Many of these studies have found that a negative public opinion increases vandalism and looting rates. Unfortunately, no quantifiable data exists which may be used to ascertain the opinions of local people in the Canyon de Chelly region.

We do have visitor survey data regarding the importance of archaeological preservation, but this data is most likely biased in favor of resource protection since nearly all visitors come to the park because of their fervent interest in history and archaeological resources (White 2007). Obviously, the data reflects this (Figure 32). A survey of local people's opinions would highly benefit the Monument.

Demand for Antiquities

Little quantitative data exist concerning the local, national, or worldwide demand for artifacts or the size of the antiquities market, but if recent estimates regarding the dollar-value of illegally trafficked antiquities are correct, the market comes second only to that of the illicit drug trade (Vitelli 1984, Lane et al. 2008). In fact, a 2007 Time Magazine article listed antiquities at the top of its list for "good investments", saying that the market was promising even for "small-time" investors (Childs 2008, p.14). These accounts indicate an unwavering, and possibly escalating desire to own a piece of the past; which endangers the nation's cultural resources. Sadly, there is no way to quantify the effect that the demand for antiquities places upon the Park's resources; we can only assume that rising demands will increase the likelihood of pothunting.

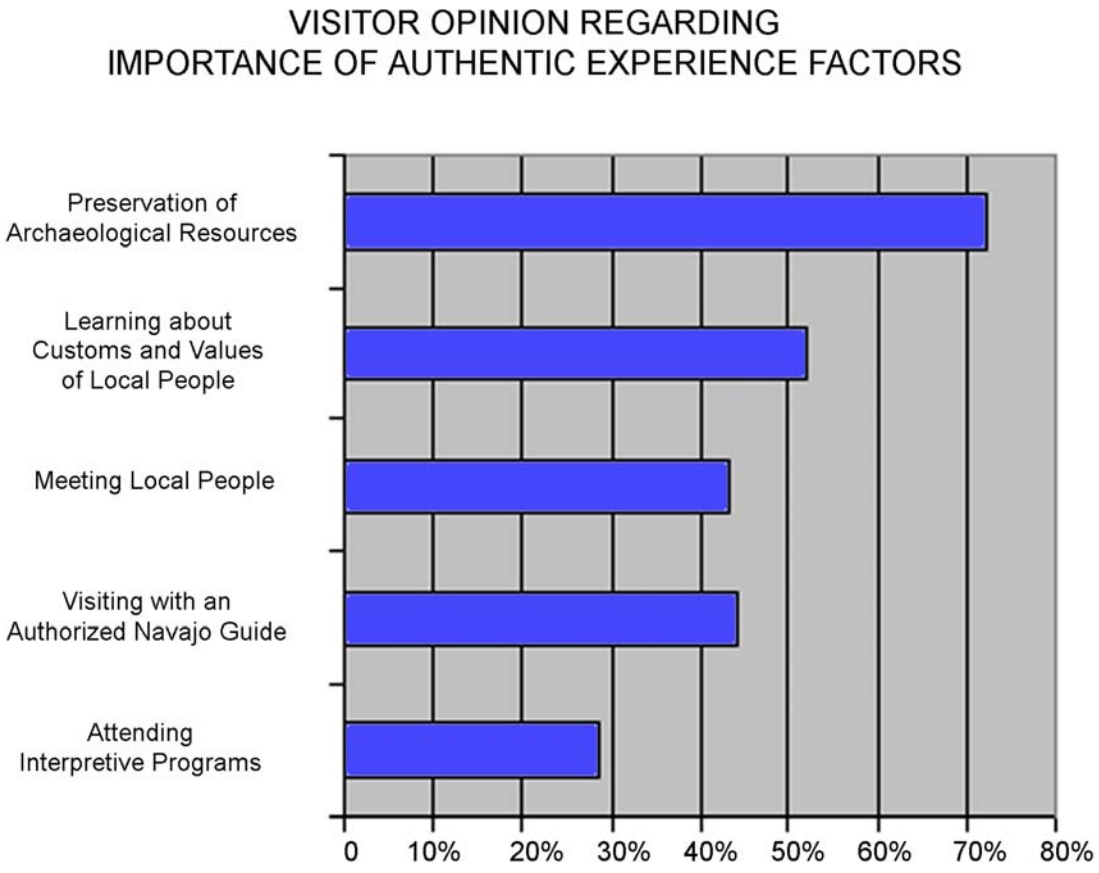

Figure 32. Survey data regarding visitor perception of authenticity.
(After White 2007, Figure 9, p.28).

Although regional factors cannot be quantified and compared directly with Canyon de Chelly's archaeological data, the general trends are clear. Little can be done to reverse poor socioeconomic conditions or the demand for antiquities, but increased ranger presence and public outreach programs which address archaeological vandalism may be effective in building relationships and enhancing the protection of cultural resources. Understanding the regional and site-specific factors which encourage archaeological vandalism, and identifying those resources which are already affected will allow resource managers to prioritize sensitive areas and sites for proactive protection.

CHAPTER V

DISCUSSION AND RECOMMENDATIONS

Discussion

The results of this analysis enhance our knowledge of site conditions at Canyon de Chelly National Monument and will foster comprehension of the agents that adversely affect cultural resources. Archaeologists will be able to prioritize the most significant, endangered sites for protection and monitoring. They will also be able to identify characteristics which may subject sites to vandalistic activity immediately in the field during field survey. All of this information is critical in maintaining cultural resources in their present condition, and in ensuring appropriate fiscal and personnel management.

Quantifying the condition and integrity of sites showed that most resources are rated at the good and fair levels, which speak to the outstanding preservation exhibited at Canyon de Chelly and for which the park is famous (Figures 18, 19). When examining the degree of impairment from visitation, vandalism and pothunting, it has been verified that roughly

half (45%) of the park's known archaeological resources are affected. Most of this damage originates from visitation, which is considered incidental. If visitation data are eliminated, less than a quarter of the known population is affected by malicious acts (Figure 33). This figure is encouraging, because it is surprisingly lower than what has been estimated for known sites on public lands in the region (McAllister 1980, GAO 1987). Additionally, the majority of sites that are affected by these three agents exhibit only minimal and moderate levels of impairment, demonstrating that the canyon's resources are in relatively decent condition compared to those in other Southwestern areas (Figure 34).

This study also evaluated the factors proven to encourage visitation, vandalism, and looting in other areas, and used statistical methods to determine whether these factors are significant at Canyon de Chelly. Additional agents were also subjected to this analysis to determine their potential influence. Some factors were quantifiable and were compared to park data. Other factors that were unquantifiable, but are thought to be influential were also discussed.

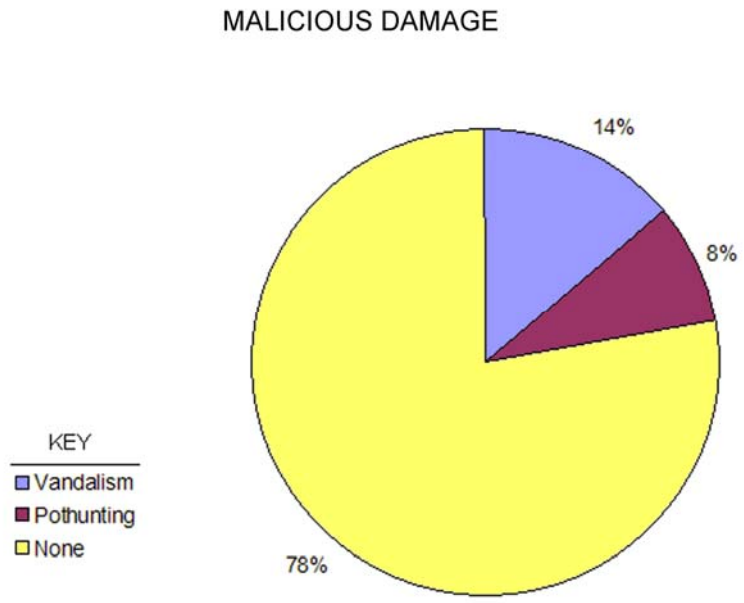

Figure 33. Malicious damage totals.

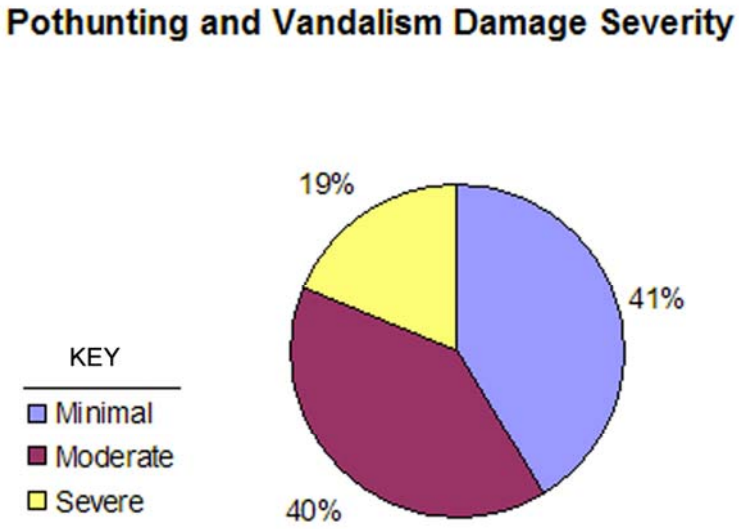

Figure 34. Malicious damage severity rate.

Those sites with damage from visitation and vandalism seem to be more accessible, but luckily easier access does not seem to affect severity rates. Unfortunately visitation damage levels increase as access becomes less complicated. This seems plausible; the more accessible a site is, the more visitation it receives, and the more damage is incurred. Access does not correlate significantly with the presence of pothunting damage, which indicates that looters are not deterred by the inaccessibility of a site if it appears promising in yielding marketable objects.

Resources that are more visible are thought to peak people's curiosity, encouraging them to visit and exploit sites. The relative visibility of a site at Canyon de Chelly seems to be related to the presence of graffiti. This is surprising, since it was theorized that visitation and pothunting damage would also be related; other authors have indicated that easily visible sites seem to be impacted by all forms of damage (Nickens 1991, Christensen et al. 1996, Bundy 2008). Furthermore, it is perplexing that visitation associated with the production of graffito is not causing incidental damage. The association of graffiti with rock art sites (discussed below) is one possible explanation for this result. Since many rock art sites lack sensitive archaeological features such as middens and architecture that may

be adversely affected by the foot-traffic of vandals, no additional site damage is incurred.

The rate of visibility did exhibit a link with vandalism and visitation damage severity, indicating that as sites become less visible, the magnitude of damage declines. Some graffiti is borne from what is called "irresistible temptation"; that is, the more visible a site, the more notoriety the vandal will receive when their symbol is observed (Goldstein 1996, p.33). This concept may also explain the relationship between graffiti and rock art; since epigraphs are already present, adding additional marks may seem enticing and therefore completely acceptable (Figures 35, 36). Visibility showed no relationship with pothunting, proving that looters are neither encouraged by the hidden nature of a site, nor deterred by its openness.

A site's notoriety has proven to be a factor in the targeting of resources in other areas (Nickens 1991). It was theorized that archaeological sites which have been well-known to local Navajos, scholars and visitors prior to the APP survey would have more damage resulting from visitation, vandalism and pothunting. Some of these sites have been published on maps and in scholarly and popular literature as early as the

Figure 35. Highly visible boulder with recent graffiti.

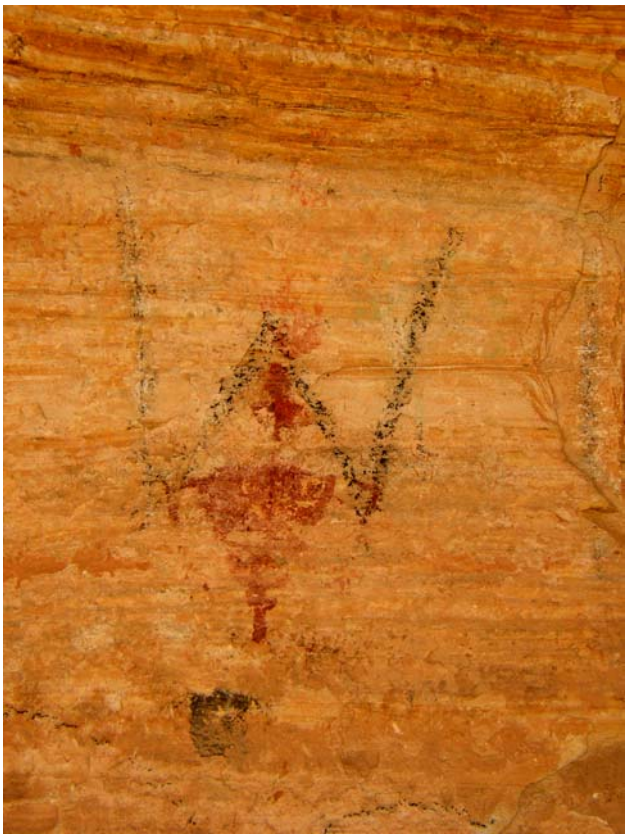

Figure 36. Red Basketmaker pictograph with a recent (ca. 1998) charcoal initial. Yucca Cave.

19th century (Travis 1995). Statistical investigation verified that these sites exhibited more damage from all three factors than the unknown sites. The amount of damage from all three factors was also more severe. Therefore, the prominent status of a site increases the possibility of damage and severity from visitation, vandalism and looting.

Although a site's size is sometimes associated with its visibility, this is not always the case at Canyon de Chelly, so size was statistically compared to the presence and rates of destruction. It was confirmed that as site size increases, there is a greater chance of damage from visitation, vandalism and pothunting, but that the intensity of the destructive agents does not necessarily increase.

The research potential of a site has not been explored by other studies as a factor that is correlated to visitation, vandalism and pothunting damage, but this is probably due to the lack of information in less detailed or incomplete databases. Since this data was available for Canyon de Chelly's sites, it was examined as a potential influential factor. It was theorized that the ascribed research potential of a site might be recognized not only by archaeologists, but also by pothunters who are seeking to pillage

the most profitable sites. Unfortunately there were no relationships observed between site potential and the presence of looting or vandalism, but a small association with visitation damage was evident. Consequently, it seems that sites with research potential are intriguing to sightseers, and that this may encourage visitation.

A site's chronological affiliation assuredly plays a role in the visitation, vandalism and looting of sites, but was problematic in analysis since sites oftentimes have several chronological associations. Therefore, analysis was completed using data from both multi-component and single chronological component sites. Regrettably, a lack of an adequate sample size prevented a complete picture of damage for single component sites.

Multi-component site analysis confirmed that Archaic, historic Pueblo, historic and recent Navajo and historic Euro-American components were correlated with visitation damage, while Basketmaker, prehistoric Pueblo and historic and recent Navajo sites were associated with defacement. Basketmaker, prehistoric Pueblo, historic and recent Navajo and historic Euro-American components were significantly correlated with pothunting. Sites having historic Euro-American and Navajo components

probably figure prominently in visitation and pothunting due to historic exploration and recent use. The relationship involving Archaic sites and visitation is surprising; sites of this age do not usually attract attention, so this association is most likely due to a relationship that those sites have with other chronological components.

To more accurately define the relationship between chronological affiliation and damage, available data for single-component sites was examined. It is critical to note that the amount of this data was limited, which restricted a full analysis. Data was available for Basketmaker, prehistoric Pueblo, historic Navajo and Indeterminate period sites. Analysis was completed with these single-component data sets. Only historic Navajo sites were significantly correlated with visitation damage, while Basketmaker sites were associated with the presence of vandalism. This could be due to the presence of large rock art panels, which are commonly found at Basketmaker sites; this was explored in more detail during analysis of site physical components. Pothunting damage was associated with Basketmaker and prehistoric Pueblo sites. This result is to be expected, as sites from these periods have been the principal target for looters for almost two centuries.

It is critical that resource managers know which physical features are enticing visitors, vandals and looters. Other vandalism studies have not yet examined this factor in detail, probably because of a lack of data. Canyon de Chelly's database does contain this information, so it was imperative to examine any significant associations.

Analysis of prehistoric sites found that the presence of rock art and human remains are associated with visitation damage, while with historic sites, visitation exhibits a correlation with architectural and non architectural components. These results seem sensible; Canyon de Chelly is well-known for its prehistoric rock art, and several thousands of visitors come to observe it each year. In addition, Navajo architecture such as hogans and sweat-lodges, and non-architectural features such as corrals and orchards are very prominent in the canyon landscape. This probably spikes the casual visitor's curiosity and encourages visitation (Figure 37).

Vandalism is associated with every prehistoric feature type, but has the strongest correlation with rock art. Only the presence of rock art was significant at historic sites. Therefore, the presence of rock art from any

Figure 37. Remains of a historic Navajo sweatlodge on the canyon rim.

Figure 38. Sign on fence at Mummy Cave Ruin.

period appears to be the most influential physical feature which encourages graffiti.

All prehistoric and historic features, aside from human remains, were significantly related to pothunting damage. There was a high Chi-square value with both rock art and architectural components. Rock art alone should not attract pothunting, so this relationship is probably due to rock art's association with architectural components at prehistoric sites. Architectural features such as Basketmaker storage cists and Puebloan rooms, were commonly used for human interment, which explains the association with pothunting damage. Unfortunately, sample size was not large enough to examine pothunting in relation to the presence of human remains, but it is postulated to be significant. The potential of this factor to encourage pothunting should be re-examined when improved data allow.

It was theorized that at Canyon de Chelly, areas higher in site density would be found to be significantly related to each agent of deterioration. Only vandalism and pothunting damage produced significant correlations with site densities, therefore malicious activity is associated with areas with

more sites. There were no correlations between the severity ranks of any agents and site density.

Other factors correlated with visitation, vandalism and looting damage that were not statistically comparable to Canyon de Chelly's site-specific factors were also examined. These included a lack of guardianship, poor socioeconomic conditions, and an increasing demand for antiquities. The figures for each one of these agents are distressing, and regrettably little can be done to directly impact these local, regional and nationwide socioeconomic conditions, or to decrease the worldwide demand for artifacts. Despite this, measures can be taken to proactively protect the cultural resources of the park.

Recommendations

In 1989, archaeologists, law enforcement officers, land managers and lawyers convened for an SAA-sponsored working conference on archeological vandalism and looting. These experts produced a report in which they identified the nature of the problem, and presented strategies to prevent further destruction. These recommendations included increasing enforcement, education, public outreach, and the use of volunteers (SAA

1990). What seems absent from their list are physical deterrents, the continued collection, enhancement and analysis of data, the inclusion of a tribal voice in resource protection and public outreach, and the development of a site vulnerability assessment. All four additional strategies may be crucial to the enhanced protection of Canyon de Chelly's resources.

Before recommendations can be made, extant strategies to dissuade illicit activity in the park must be evaluated. At the site level, physical barriers such as fencing and signs that present information on laws and potential fines are utilized at sites which are thought to be at risk for visitation, vandalism, or damage from livestock (Figures 38, 39). These have been effective in most instances, but negligible in others, as persistent persons have cut or smashed fences to reach resources (Figure 40). Nevertheless, these deterrents should continue to be utilized at the most threatened sites.

Rangers strive to show as much presence in the park as possible within financial and personnel constraints. Park Police regularly patrol the Monument, but their efforts are frequently concentrated on the inhabited canyon rims, at overlooks, and at the handful of inner-canyon

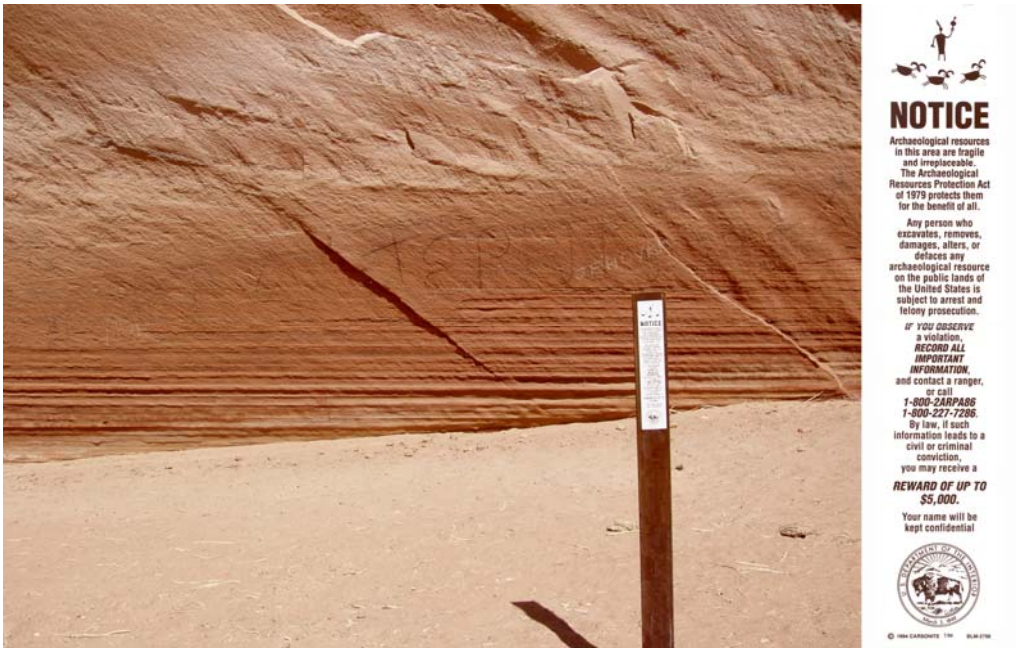

Figure 39. ARPA sign erected at Ledge Ruin. Modern graffiti on cliff in background. Detail of ARPA sign at right.

Figure 40. Park Archaeologist next to breached Yucca Cave Ruin fence and ARPA sign.

archaeological sites that are open to visitation (Figure 41). Other NPS Rangers, such as archaeologists, interpreters, biologists and maintenance workers show presence in the park more commonly in the spring and summer months, while there is sporadic ranger visibility during the remainder of the year.

Keeping workforce and budgetary constraints in mind, consistent ranger presence should be exhibited throughout the park. Data available from this study will allow a prioritization of sites for increased patrols, and a predictive model of "at risk" sites.

Predictive analysis may be used to assess the vulnerability of cultural resources to future acts of looting and defacement. This tool is also called "Site Vulnerability Assessment" (SVA) by Christensen et al. (1996). The GAO stated that only 7% of all sites on federal lands in the Four Corners region have been identified; the vastness of the area and the lack of funding and staff has left the majority of resources unprotected (1987, p.2). Vulnerability assessments provide a tool to prioritize known sites for protection based on factors identified as encouraging vandalism in the area.

Figure 41. Chief of Law Enforcement, William Yazzie speaking with visitors at an overlook.

Figure 42. Chief of Interpretation, Wilson Hunter, Jr. giving a presentation on the Navajo hogan.

This tool is dynamic; as new sites and influential variables are discovered, priorities may be reassessed.

Prediction of archaeological vandalism is a fairly new concept that many federal agencies have not yet adopted; however archaeologist Martin McAllister, who was involved in the development of the concept, feels that it is a critical component to any cultural resource manager's toolkit (Personal Communication, 2008). There are two primary benefits of this predictive analysis: sites that need additional monitoring or surveillance are identified, and the agency can develop a protection plan and corresponding budget (Cast and Pertulla 2002). Additionally, data quantifying archaeological vandalism will allow resource managers to seek funding to supplement cultural resource protection efforts.

Park archaeologists should assist Park Police in the formulation of a protection and monitoring schedule based on this SVA; this should be reviewed and updated each year. In the future, geographical analysis could allow rangers to prioritize larger areas of sensitivity for patrol. Increased presence will not only deter potential vandals, but will also foster positive relationships with visitors and local peoples. Additionally, NPS should re-

assert its intent to enforce all applicable laws, relentlessly pursue offenders, and publicize infractions through official park press releases (SAA 1990).

Many authors have identified public outreach as critical avenues for better public opinion and increased resource protection (Nickens 1991, Christensen et al. 1996). When interpretive and archaeological professionals share their knowledge, the public feels connected with the resource and has an increased sense of stewardship. At Canyon de Chelly, public outreach is not consistently employed; interpretive programs only exist during the seven-month high visitation season, which begins in March and ends in September (Figure 42). A program about general resource stewardship has been presented in the past, but no current programs address the value of the canyon's archaeological resources, or the laws which protect them. No in-classroom ranger presentations occur either locally, or in the region. A brochure entitled, "Our Vanishing Treasures" does address this issue and is available at the Visitor Center, but no museum or wayside exhibits broach the topic.

To succeed in curbing future damage from visitation, vandalism and looting, public presentations which share the objectives of archaeology, the

scientific and humanistic importance of cultural sites, and the nature of archaeological vandalism should be developed. The visitation off-season is a perfect time to work with schools. Interpretive and archaeological professionals must consistently visit local classrooms, and must share their expertise with local schoolteachers to develop curricula that promote a conservation ethic.

What distinguishes Canyon de Chelly from the other 391 Park Service units is the community of approximately 50 Navajo families that live within the park boundary. Many of these residents are officially sanctioned tour guides, and already consider themselves as informal stewards of the canyon (Figure 43). This provides another level of protection for the canyon's resources, as residents work in concert with NPS by providing information about illicit activities. Although this is not a formalized relationship, the potential to develop this into an official partnership exists, and should be explored. Various land managing agencies, including state and tribal governments administer successful site stewardship programs; these have proven effective in deterring vandalism (Henry Renaud 2002, Bundy 2008). Beginning a similar program at the park might provide local people with an

Figure 43. Canyon resident and tour guide, Larry Tso *left* and Park Archaeologist, Keith Lyons *right*, work together to answer visitor questions on a tour.

increased sense of pride and involvement in the protection of their resources.

Current archaeological inventory and monitoring programs should be continued, however the collection of information specific to visitation, vandalism and pothunting should be improved. This data will be critical in assessing the ongoing consequences of destructive agents, in quantifying future damage, and in evaluating the effectiveness of protective measures. A vandalism form should be developed to capture both quantitative and qualitative data; and should be field-tested to ensure its effectiveness. Current databases should be updated to include this information so it may be readily accessed and analyzed. Furthermore, park archaeologists should assist the Interpretive Division in creating updated materials, and should take a more active role in communicating current archaeological information through official NPS presentations.

CHAPTER VI

CONCLUSIONS AND FUTURE WORK

Archaeological sites are a finite resource, and their destruction impairs the study and comprehension of human history. Federal agencies such as NPS are charged with the protection of these resources and need to quantify and identify potential motivations of the damage to accomplish this objective. Human-caused agents of destruction, such as incidental damage from unauthorized visitation, and malicious vandalism and pothunting have prompted copious studies, but few have analyzed extant data to determine statistical relationships between damage and site characteristics.

One of the impediments to understanding the impetus for these agents is the lack of empirical data. Luckily, an accurate and complete database for Canyon de Chelly National Monument allowed statistical analysis of damage resulting from these three agents. The results of the analysis will facilitate the design and implementation of proactive measures to protect the Monument's sites.

This study concentrated on those sites having damage from visitation, vandalism and pothunting, but sites lacking damage should also be analyzed in the future to identify factors which may be discouraging human activity. In addition, as different topographical areas are inventoried, additional analysis should take place to identify factors that encourage damage which may be specific to those areas. Furthermore, archaeologists at other park units and agencies must be encouraged to collect enhanced data regarding site condition and archaeological vandalism at their sites. This will allow a comparison and more thorough comprehension of the problem on park-specific, regional and national levels.

This study has identified some of the physical and ascribed characteristics of Canyon de Chelly's archaeological resources which encourage illicit activity, and has recommended proactive solutions to ameliorate the problem. Vandalism seems to be notably related to the presence of prehistoric and historic rock art, while pothunting is concentrated at sites having observable architecture. It is thought that unauthorized visitation, which is the cause of most damage at the canyon, will be the easiest to control with physical deterrents and an active public outreach program.

The public has an unwavering interest in archaeology, and resource managers must realize that the public must be engaged consistently to promote the protection of cultural heritage. Engaging the public with both active and passive media, and directly involving them in resource management through a site stewardship program, should assist in decreasing the amount of damage stemming from illicit site visitation, vandalism and pothunting.

Finally, it is critical to understand that archaeological vandalism is a complex problem with no single, easy solution. An increased comprehension of the resources we protect and the agents that affect them will help to alleviate the problem, but unfortunately there will always be individuals who seek to vandalize and profit from archaeological sites. Despite this, resource managers must not become discouraged or abandon their commitment to protect the resources which are irreplaceable pieces of our collective heritage.

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