Department of Defense
Legacy Resource Management Program

PROJECT 07-370

After the Smoke Clears: A Cross-Cultural Approach to Assessing the Effect of Wildland Fires on Traditional Cultural Properties

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October 2008

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In 1990, Congress passed legislation establishing the Legacy Resource Management Program to provide financial assistance to the Department of Defense (DoD) efforts to preserve our natural and cultural heritage. The program assists DoD in protecting and enhancing resources while supporting military readiness. A Legacy project may involve regional ecosystem management initiatives, habitat preservation efforts, archaeological investigations, invasive species control, Native American consultations, and/or monitoring and predicting migratory patterns of birds and animals.

*Three principles guide the Legacy program: **stewardship**, **leadership**, and **partnership**. Stewardship initiatives assist DoD in safeguarding its irreplaceable resources for future generations. By embracing a leadership role as part of the program, the Department serves as a model for respectful use of natural and cultural resources. Through partnerships, the program strives to access the knowledge and talents of individuals outside of DoD.*

Prepared By:

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And
Wyoming Army National Guard

October 2008

EXECUTIVE SUMMARY

In November 2006, the Wyoming Army National Guard (WYARNG) and engineering-environmental Management, Inc. (e^2M), were awarded project funding from the Department of Defense Legacy Resource Management Program. This funding has allowed the WYARNG to provide Department of Defense land managers and Cultural Resource Managers a cross-cultural approach for assessing damage to Native American Traditional Cultural Properties affected by wildland fires. While successful efforts have been made by Cultural Resource Managers and archaeologists in land managing agencies to assess the effects of fire and fire suppression methods on archaeological sites from a scientific perspective, this project sought to obtain a traditional cultural perspective from Native American tribal people.

Most Department of Defense installations have Standard Operating Procedures (SOPs) for determining adverse effects to archaeological and historic sites. The purpose of this document is to provide an SOP to assist Cultural Resource Managers in evaluating damage and taking proactive measures to prevent damage to Traditional Cultural Properties in wildfire events. In May 2007, a symposium took place at Camp Guernsey, a WYARNG joint training center located in Platte County, Wyoming. The meeting invited discussion regarding how fire and fire-fighting actions can affect Traditional Cultural Properties. During the symposium it was determined that the SOP should incorporate procedures prior to, during, and after a wildland fire event. This project was completed as a collaborative effort between military personnel, contracting cultural resource professionals, state and federal Cultural Resource Managers, and most importantly, Native American representatives.

This project is intended to provide a guideline for federal installations to generalize, adopt, and modify as appropriate to each specific location. The methods, research, and conclusions utilized during this project are specific to a particular group of Native Americans with particular interest in the Camp Guernsey, Wyoming, area. All of the recommendations are intended for development, review, and approval, and for use in conjunction with tribal consultation and the Section 106 process. Foremost recognition must be given to the sensitive nature of Native American Traditional Cultural Properties and the confidentiality of sacred site location information.

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TABLE OF CONTENTS

LIST OF FIGURES

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ABBREVIATIONS AND ACRONYMS

AIRFA	American Indian Religious Freedom Act
ARPA	Archaeological Resources Protection Act
BAER	National Park Service Burned Area Emergency Response
CFR	Code of Federal Regulations
CRM	Cultural Resource Manager
°C	degrees Celsius
DoD	Department of Defense
°F	degrees Fahrenheit
GIS	Geographic Information System
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
NAGPRA	Native American Graves Protection and Repatriation Act
SOP	Standard Operating Procedure
TCP	Traditional Cultural Property
U.S.C.	United States Code
WYARNG	Wyoming Army National Guard

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1. INTRODUCTION

The Wyoming Army National Guard (WYARNG) received funding through the Department of Defense (DoD) Legacy Resource Management Program to develop guidelines for assessing damage to Native American Traditional Cultural Properties (TCPs) affected by fire. The Legacy Resource Management Program funding assists the DoD in the preservation of natural and cultural resources while maintaining military readiness. This funding enabled the WYARNG to organize a symposium where issues regarding the effects of fire and fire-fighting activities on TCPs were discussed in preparation for the development of a Standard Operating Procedure (SOP). This document represents the culmination of the project. It summarizes the key points of the symposium and presents the SOP. The goal of the project is to bring awareness of this issue to DoD Cultural Resource Managers (CRMs) and to serve as a framework for use in cultural resource management throughout DoD installations.

During the summer of 2006, two large wildland fires affected over 17,000 acres of grassland and mixed shrubland at Camp Guernsey, a WYARNG joint training center located in Platte County, Wyoming. In addition to affecting military training activities and impacting the natural ecosystem, the fires burned across hundreds of previously documented cultural resources. Numerous archaeological inventories indicate the Camp Guernsey area has been used by people for over 10,000 years. Site types include prehistoric open camps, stone circles and other stone features, rockshelters, pictographs and petroglyphs, tool stone procurement quarries, and artifact scatters, as well as early historic emigrant trails and inscriptions and later homestead and ranch structures. Because of this rich history, Native American tribal people consider Camp Guernsey an important cultural landscape.

Cultural resource compliance requirements associated with federal activities and land management responsibilities are clear. These requirements stem from various federal laws, executive orders, regulations, policies, and directives. Section 106 of the National Historic Preservation Act (NHPA) and the Advisory Council on Historic Preservation's implementing regulations for the Protection of Historic Properties at 36 Code of Federal Regulations (CFR) 800 require agencies to consider the effects of their projects and events, such as fires, on significant cultural resources. Consultation with state historic preservation offices and Native American tribes on a government-to-government basis is mandated by the cultural resource compliance process.

Following the cultural resource compliance process by documenting fire damage to historic structures, for example, is fairly straight-forward. Considering the effects of fire and firefighting activities on other types of cultural resources, such as Native American sacred sites and TCPs, is more complex. Standard fire-damage assessment procedures generally require archaeologists to survey areas burned by wildfires, identify and evaluate archaeological and historic sites in the area of effect, and assess the effects of the fire on historic properties. These procedures are adequate for most archaeological properties eligible for the National Register of Historic Places (NRHP) under Criterion D (have yielded, or may be likely to yield, information important in prehistory or history). The procedures may not be as effective for assessing damage to sites considered by Native American tribal representatives to be sacred or valued for their traditional cultural importance.

TCPs differ from archaeological properties in the criteria that make them culturally significant or eligible for the NRHP. TCPs are eligible for the NRHP primarily because of their association with cultural practices or beliefs of a living community. They are often key to a group's history or important for maintaining the cultural identity of the community. The National Park Service's National Register of Historic Places Bulletin #38, *Guidelines for Evaluating and Documenting Traditional Cultural Places,* provides information and sets forth the criteria for documenting and evaluating TCPs (Parker and King 1998). Native American TCPs take many forms. They can cover entire landscapes or be confined to a

specific location. For example, the sandbars along the northern Rio Grande in New Mexico are considered TCPs because they have been used for ritual purposes by members of Sandia Pueblo for centuries. Landscapes where sacred plants are collected can also be considered TCPs. Localized outcrops of hematite (red ocher), gathered by Native Americans and used in ceremonies for millennia, are typically regarded as sacred. A rockshelter may be considered a TCP if it contains rock art that indicates a god or spirit resided there or if ancestral burials are present. Rock art itself may be a TCP if recognized by a Native American group as having high artistic value or sacred qualities. These properties are intricately tied to communities and, as such, damage to them is best assessed by community members. This difference dictates that adequate procedures should be developed to assess fire damage to TCPs.

2. BACKGROUND TO THE SYMPOSIUM

In compliance with federal laws and regulations, Department of the Army and National Guard Bureau directives, and DoD policies for the protection of historic properties and consulting with Native American tribes, the WYARNG has established a cultural resources management and Native American tribal consultation program. The results of cultural resource inventories and government-to-government meetings conducted at the Camp Guernsey joint training center have demonstrated the importance of the region to Native American tribes. Because of the types of cultural resources found at Camp Guernsey, and recommendations made by the Wyoming State Historic Preservation Office and tribal representatives, the WYARNG initiated a TCP inventory and ethnographic study to identify, document, and evaluate places of traditional cultural importance at the training center (Hokanson et al. 2008).

The project was in progress during the summer of 2006 when two wildfires burned approximately 17,000 acres at Camp Guernsey. The Tracer Fire began in mid June as a result of an errant tracer round during a military training event (Figure 2-1). Although trained fire fighters responded immediately, the fire jumped existing fire breaks and spread quickly because of very strong winds and arid conditions. Approximately 14,000 acres burned before the fire was brought under control. The second wildfire to burn at Camp Guernsey was sparked by a lightning strike on private land adjacent to Camp Guernsey's eastern boundary in late July. Although this fire burned a smaller area, it was more intense. Both fires overlapped in an area of about 650 acres (Figure 2-2).

FIGURE 2-1. AFTER THE TRACER FIRE

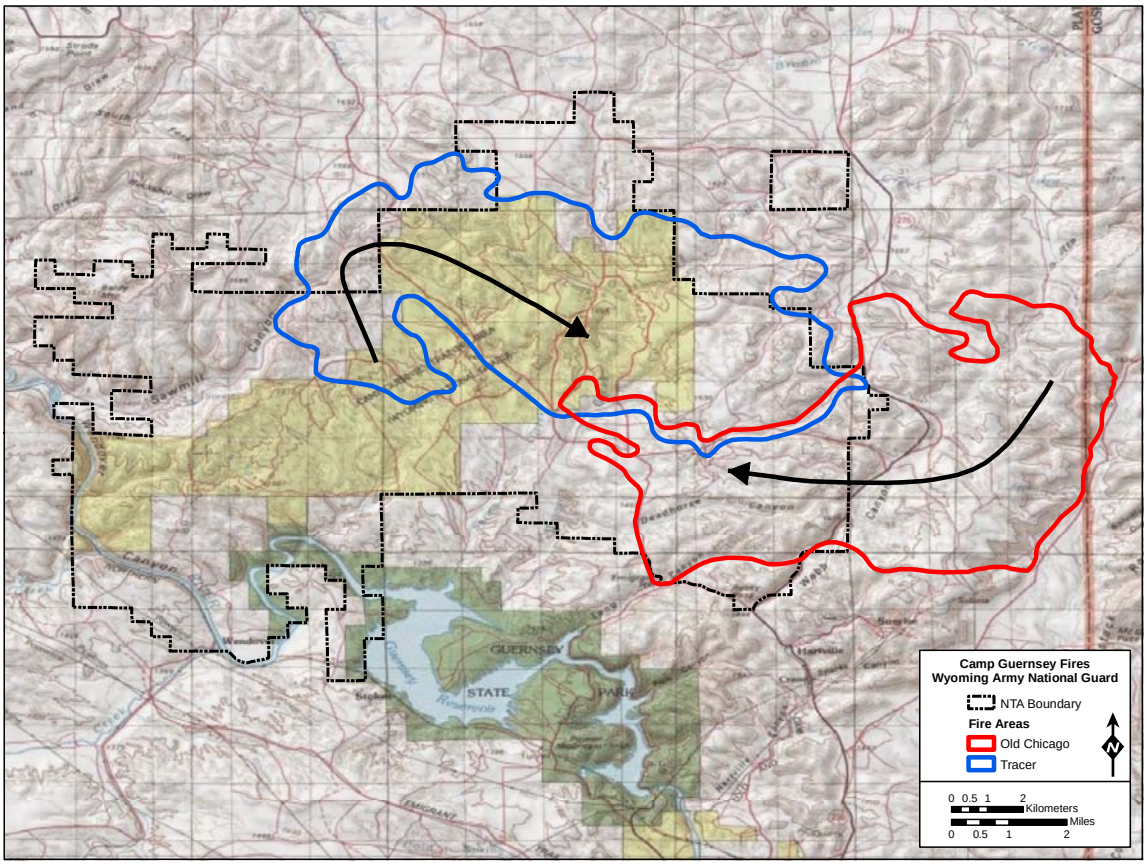

FIGURE 2-2. MAP OF FIRE BOUNDARIES AND CULTURAL RESOURCES

WYARNG has a well-respected Native American consultation program with seventeen tribes from Wyoming and surrounding states. Because of the ongoing tribal consultations and the ethnographic study and TCP survey at the time of the fires at Camp Guernsey, e²M, in conjunction with the WYARNG, submitted a proposal to the Legacy Resource Management Program to address the effects of wildland fires on cultural resources of concern to Native American tribal representatives. The Legacy Program approved the project in November 2006.

The DoD Legacy Program sponsored symposium titled *After the Smoke Clears: A Symposium to Develop a Cross-Cultural Approach to Assessing the Effect of Wildfires on Traditional Cultural Properties* was held at Camp Guernsey May 2 and 3, 2007. Attendees included 12 representatives from eight Native American tribes including the Southern Cheyenne, Eastern Shoshone, Kiowa of Oklahoma, Rosebud Sioux, Northern Arapaho, Oglala Sioux, Crow Nation, and Northern Cheyenne (Figure 2-3).

In addition to military, cultural resource, and environmental personnel from the WYARNG and Camp Guernsey, cultural resource staff from Fort Carson, Colorado, also participated in the symposium. Archaeologists and cultural resource professionals from federal and state agencies who provided expertise at the symposium included representatives from the Thunder Basin National Grassland and the Laramie Peak Unit of the Medicine Bow National Forest, Wyoming; the Wyoming State Historic Preservation Office; the Office of the Wyoming State Archaeologist; and the University of Wyoming. The project also benefited from the support and expertise of National Park Service Burned Area Emergency Response (BAER) staff and a professional archaeological conservator and rock art preservation specialist.

FIGURE 2-3. AFTER THE SMOKE CLEARS SYMPOSIUM

The two-day symposium included formal presentations and a field visit to areas affected by the wildfires (Figure 2-4). Presentations included an overview of the Camp Guernsey fires; discussions of fire effects and risks to rock art, artifacts, and archaeological and traditional cultural sites; and Native American cultural views of fire (Figure 2-5). Comments and discussion by participants were encouraged throughout the symposium. The goal of the meeting was to generate a forum for exchanging ideas in preparation for developing a SOP that will be shared with all project participants, technical advisors, and the DoD through the Legacy Resource Management Program.

The following chapters present an overview of the symposium presentation topics, a discussion of the comments and concerns raised by the symposium participants, and an explanation of the development of the SOP leading into the SOP itself. A references section provides a list of information sources on fire and cultural resources. The appendices include a list of symposium participants (Appendix A) and the PowerPoint presentations that were developed in preparation for the symposium (Appendix B).

FIGURE 2-4. SYMPOSIUM PARTICIPANTS ON FIELD VISIT

Agenda

"After the Smoke Clears: A Symposium to Develop a Cross-Cultural Approach to Assessing the Effect of Wildfires on Traditional Cultural Properties"

May 1, 2007
Evening – Symposium participants arrive at Camp Guernsey

May 2, 2007
Breakfast on Own

9:00 to 9:30	–	*Introductions*
9:30 to 9:50	–	*Presentation –The Big Picture: The Effects of Fire on the Landscape*
10:00 to 10:20	–	*Presentation – Fire and Rock Art*
10:30 to 10:50	–	*Presentation – Cultural Views on Fire*
11:00 to 11:20	–	*Presentation – The Tracer Fire at Camp Guernsey*
11:30 to 11:50	–	*Presentation – The Old Chicago Fire at Camp Guernsey*
12:00 to 1:00	–	*Lunch Break*
1:00 to 4:00	–	*Field Visit to West Side of North Training Area, Emigrant Hill, Broom Canyon and Site 48PL809*

May 3, 2007
Breakfast on Own

9:00 to 9:30	–	*Introduction and Discussion of Field Visit*
9:30 to 9:50	–	*Presentation – Fire and Rocks*
10:00 to 10:20	–	*Presentation – What are Standard Operating Procedures*
10:30 to 10:50	–	*Presentation – What Are Damage Assessments*
11:00 to 11:50	–	*Open Discussion*
12:00 to 1:00	–	*Lunch Break*
1:00 to 4:00	–	*Field Visit to East and Central Side of North Training Area*
6:00 pm	–	*Sponsored Dinner*

May 4, 2007
Morning – Symposium participants depart Camp Guernsey

FIGURE 2-5. SYMPOSIUM AGENDA

3. THE EFFECT OF FIRE ON THE LANDSCAPE

Fire is an important and essential ecological process. In the past, land management agencies focused fire control efforts on suppression and prevention, which resulted in the accumulation of hazardous levels of fuel across the landscape. Currently, land managers recognize the need for fire in resource renewal and maintenance, and have introduced controlled burns to specific areas. With an increase in knowledge and understanding of fire behavior, resource managers are beginning to predict the effects fire can have on the landscape. It is possible for CRMs to use similar models in predicting which resources will be most affected by fire and thereby minimize the risk of damage. Furthermore, managers must have a means of assessing resource damage after a fire. This chapter introduces the basic characteristics of fire that provide a platform for management considerations.

Some important issues to consider when dealing with wildland fire include knowing how hot the fire will get, how long the fire will be hot, and where resources are in relation to the heat of the fire. Consideration must also be given to possible impacts that can adversely affect cultural resources from fire suppression activities, as well as the natural processes that can occur and affect cultural resources after the fire is extinguished.

3.1. Fire Basics

Fire is composed of fuel, oxygen, and heat. The interaction of these three components is what creates fire; without one part, the fire is extinguished. A fire's energy is dependent on the combined sources of heat and fuel (Figure 3-1). Fuel is any combustible material, the burning of which feeds the fire. The amount of moisture within a fuel source also affects the amount of heat and energy a fire will release. The energy release rate (the speed at which a fuel source burns) and the duration of burning affect how much heat will be created and how it will reach any cultural resources (Bjork n.d.).

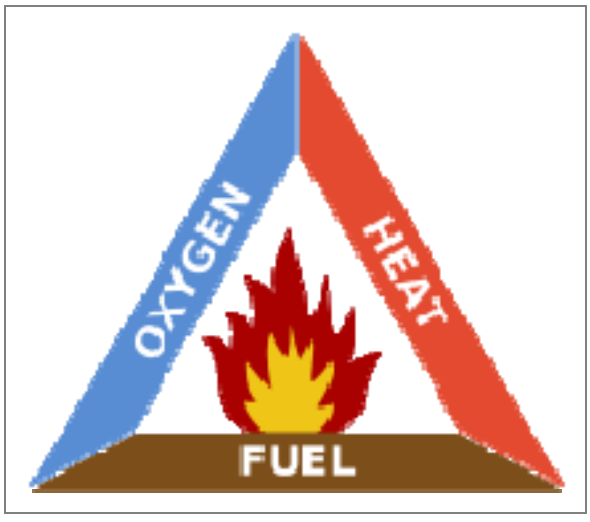

FIGURE 3-1. THE FIRE TRIANGLE

Three types of fuel accompany three types of wildfire. The first is ground fuel resulting in ground fire. Ground fuel includes surface duff, rotten logs, and roots. Ground fires have characteristically low energy release rates, long duration, and relatively deep soil heating. The second type is surface fuel, which includes grasses, forbs, low shrubs, and seedlings. The characteristics of surface fires vary

according to the specific environment, the amount of fuel, and the moisture content of the fuel. The third type, aerial fuel, includes tall shrubs, trees, and snags. Aerial, or crown, fires are generally characterized by rapid rates of spread with flame lengths in excess of 10 meters (Hall n.d., Winthrop 2004).

The heat and duration of the burn is determined by the unique fire environment. Factors to consider when predicting fire behavior include: the type and amount of fuel, the type of soil, the moisture content of the soil and fuel, the weather, and the geography of the area. Each of these factors can change the behavior of fire within minutes (Hall n.d.).

3.2. Fire Impacts to Material Culture

Native American TCPs are tied to the traditions and culture of communities. Because TCPs are often related to the history of a people, artifacts are often located at these sites. Material culture is important to the integrity, identity, and feeling of the TCP. An understanding of the impacts to material culture from wildland fire can help determine appropriate avenues for prevention and damage assessments. The temperature and the duration of a burn directly impact the amount of damage sustained by certain types of material at archaeological sites and TCPs. Degrees of damage are also determined by the composition of the artifacts themselves. Some artifacts can withstand high temperatures better than others. It is important to consider that fire does not generally damage or affect buried artifacts. Artifacts can withstand heat damage with as little as a few centimeters (<10 cm) of soil cover. However, there are conditions when heat is transferred below the ground surface, thereby threatening buried artifacts. Some examples include smoldering stumps and roots that conduct heat and can damage nearby artifacts (Winthrop 2004:2).

In addition to the direct impacts of the fire itself, operational and indirect impacts can also damage cultural resources. Some direct impacts include damage from flame exposure, radiant heat, convective heat, and smoke (Figure 3-2).

FIGURE 3-2. DIRECT IMPACTS FROM WILDLAND FIRE AT CAMP GUERNSEY, WYOMING

Operational impacts result from ground disturbance and the use of fire suppression chemicals and retardants. Ground disturbance from heavy equipment, vehicle staging areas, and fire breaks can destroy archaeological features and artifact context (Figure 3-3). Fire suppression chemicals and retardants can stain and ultimately destroy the surface of masonry or rock faces.

FIGURE 3-3. FIRE SUPPRESSION ACTIVITY IMPACTS

Indirect impacts include a risk of vandalism from increased exposure and damage from eroding soils. Erosion is often prevalent in burn areas. The movement of soils can remove artifacts from their original context in the ground, and the soils can wash over and erode rock art surfaces. Tree mortality is also a risk to nearby cultural resources. Falling snags can destroy historic buildings and other architectural features and damage rock art panels. The following sections provide a brief summary of how fire can impact some types of cultural material and features. For a more comprehensive discussion, refer to Buenger (2003).

3.2.1. Rock Art

Rock art is at risk of damage from direct, operational, and indirect impacts during and after wildfire events. The rock itself can be damaged by smoke and heat. Soot smudging and discoloration obscure the images, organic paints can change from the heat, and damage to the varnish can ruin a panel's potential for dating. In some cases, the rapid heating and cooling of the rock surface causes cracks and spalling. Because of the delicate nature of rock art, the use of fire retardants, slurry, foam, and even water should be avoided near known rock art panels during a fire.

Rock art located adjacent to fuel sources, panels with an aspect toward prevailing winds, and panels in areas susceptible to crown fires are at the highest risk of being harmed during fire. Sites located within narrow canyons are especially at risk for damage from fire. The topography of the canyon causes the fire to spread rapidly at very high temperatures (Kelly and McCarthy 2001:170; Bjork n.d.).

Indirect impacts to rock art from a fire event include weakened rock surfaces, tree mortality, erosion, and vandalism resulting from increased visibility. The amount and density of fuel in direct proximity to rock art will affect the amount of heat damage from a fire. The more fuel accumulated at the site, the longer the burn and the longer the panel is exposed to intense temperatures. Although a panel may appear intact after a fire, microscopic cracks on the rock surface may be present. With time, these cracks

will weaken the surface of the rock and cause irreparable damage to the panel, including spalling (Kelly and McCarthy 2001:171; Bjork n.d.).

The potential for damage to rock art is not diminished after the containment of a fire. There is a risk of weakened snags falling against or scratching the surface of a rock art panel. Erosion is prevalent and rock art may be damaged from mud and ash washing over from above. Lack of vegetation leaves areas exposed to harsh dust storms which also can accelerate erosion on the rock surface. Finally, another post-fire concern is vandalism. Areas once afforded the cover of vegetation are suddenly open and at risk of discovery by potential vandals.

3.2.2. Chipped and Ground Stone Artifacts

Damage to chipped and ground stone artifacts depends largely on the heat and duration of exposure to the fire. Obsidian artifacts are valuable in that not only can the artifacts be dated using hydration methods, but it is also possible to determine the source of the rock. But when exposed to high temperatures, the hydration bands within the obsidian can be destroyed rendering the potential for dating useless. However, the ability to establish the source of the material remains intact (Buenger 2003; Winthrop 2004). Exposure to high temperatures leads to cracking and, potentially, melting of obsidian artifacts.

The effect of fire on chert varies according to the source and prior heat-treatment activities. When exposed to high temperatures, chert will fracture, craze, shatter, and change color or lose its luster. Chert artifacts become brittle and can break easily after exposure to fire (Winthrop 2004).

The damage sustained by ground stone artifacts is largely determined by the type of material they are manufactured from. For example, sandstone will break and crack at lower temperatures than basalt, while granite and quartzite can withstand high temperatures. Rapid heating and cooling, or thermal shock, will cause ground stone artifacts, including bedrock mortars, to crack and spall (Buenger 2003; Winthrop 2004).

Organic material associated with chipped and ground stone artifacts increases potential archaeological data recovery and analysis options for specific sites. Depending on the temperature and duration of the fire, plant and animal residues can survive a fire. Pollen is destroyed at temperatures above 572 degrees Fahrenheit (°F) (300 degrees Celsius [°C]), but animal protein withstands temperatures up to 1472°F (800°C) (Winthrop 2004).

3.3. Mitigating Fire Impacts to Cultural Resources

In order to preserve and prevent damage to valuable resources, CRMs should implement some strategies as part of their fire management plan. One possible strategy for protection is the use of exclusionary measures. These measures prevent the fire from burning on or near a cultural resource by using a predetermined fire management action. Some examples might include fuel reduction near rock art, creating fire lines near resources, and the use of fire shelter material to protect important elements or features, such as rock art (Bjork n.d.; Kelly and McCarthy 2001; Winthrop 2004).

Selective fuel reduction near rock art resources is one of the most beneficial means of protection. Fuel removal will decrease smoke damage and heat damage to rock surfaces. Another option is to create fire lines surrounding the areas needing protection. This approach entails planning, coordination, and communication with installation fire management officials.

Some risks associated with exclusionary measures may outweigh the benefits. For example, fuel reduction near rock art may expose previously hidden panels to the public. Creating fire lines near, or

surrounding, resources will prevent potential damage from a specific fire. However, the area is exposed as an oasis of vegetation in a landscape of charred and burned material. Because the fuel load is allowed to accumulate, another risk is an increased threat of future fires in areas that are protected during prescribed burns.

The type of equipment used to fight the fire may also be planned for and controlled in the vicinity of sensitive cultural resources. Instead of heavy bulldozers, the CRM can request the use of hand shovels on the fire line at specific locations. While not failsafe, this approach allows for less ground disturbance and more protection for the resources. As discussed in the previous section, some fire retardants and chemicals may not be suitable for use on cultural resources, and land managers should be informed about when and where these materials should be avoided.

Non-exclusionary measures are also effective in controlling fire damage to resources. In this scenario, the fire is allowed to burn through sensitive resource areas but at a lower intensity and a shorter duration, thus minimizing potential impacts. These efforts include fuel thinning and reduction as well as prescribed or controlled burns. As Winthrop explains: "Wildland fire is generally more destructive to cultural resources than prescribed fire, since it includes both uncontrolled fire effects and the effects of fire suppression" (2004:2). The benefits of prescribed fires include control over the temperature (generally below 932°F [500°C]) and duration (less than half an hour) of the burn. CRMs should coordinate and participate in the planning process to minimize potential effects to sensitive resources.

Extensive documentation by a specialist provides another non-exclusionary measure of protection as well as a baseline assessment for later use. This might involve photographic, video, and narrative documentation of significant resources prior to a fire event (Kelly and McCarthy 2001:174).

Thorough planning is the key to prevention and protection. When these measures have been explored before an emergency situation arises, communication and management decisions reflect the importance of the resource. Because damage caused by fire to rock art and cultural resources is often difficult if not impossible to restore, preventive measures are the most effective in preservation (Kelly and McCarthy 2001).

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4. NATIVE AMERICAN VIEWS OF FIRE

The literature regarding the use of fire by Native Americans tends to focus on practical applications and the resulting effects to the ecosystem (see Pyne 1982, Lewis 1983, Fisher et al. 1987). The use of fire as a tool to manipulate the environment and maintain the ecosystem, as well as its role in the spiritual realm, will be discussed here as it pertains to the background information gathered for the symposium. Tribal representatives prepared presentations explaining the importance of fire in their respective cultures.

4.1. Fire as a Tool

Native American knowledge and use of fire as a method of manipulating the environment have been documented for hundreds of years. The earliest accounts of Native Americans and fire come from the journals and writings of European explorers (Wroth 1970; Pyne 1982; Day 1953). It is known that Native American tribes used fire as a tool. As Pyne explains:

> It is hard now to recapture the degree to which Indian economies were dependent on fire. In its domesticated forms, fire was used for cooking, light and heat. It made possible ceramics and metallurgy. Its smoke was used for communication. It felled trees and shaped canoes. It was applied to the cultivation and harvest of natural grasses… Fire was sometimes used to kill off broad expanses of forest, which might then be harvested for firewood (1982:71).

It is not surprising, then, that fire was often used in hunting, crop management, warfare, clearing, as well as for a variety of other reasons. Intentional burning was used to divert big game into easily accessible open prairies, into narrow valleys or ravines, or over cliffs where the animals were more easily killed. Uses for fire extended to smoking out bees, raccoons, and bears. New growth also attracted desirable grazers and so the people would intentionally burn a stand of grass and place snares in preparation for the fresh growth (Pyne 1982:74). Botanist Edwin James of the Long Expedition of 1819 remarked, "[the hunters] set fire to the plains, in order to attract herbivorous animals, by the growth of tender and nutritious herbage which springs up soon after the burning…" (Pyne 1982:76).

Another method of hunting with fire is explained by Thomas Jefferson, "…they make their circle by firing the leaves fallen on the ground, which gradually forcing animals to the center, they there slaughter them with arrows, darts, and other missiles" (Pyne 1982:75).

Intentional burning also aided in the harvest of wild and cultivated crops as well in clearing fields for planting. In the absence of other forms of fertilizer, fire was a logical practice for replacing lost nutrients in the soil, whether used in natural harvests or agriculturally cultivated. Fields were burned depending on the type of crop and the annual yield. For example, cereal grasses were burned annually, while basket grasses and nuts were burned every three years. For large timber uses, the duration between intentional burning increased to between 15 and 30 years (Pyne 1982:74).

As stated by H. T. Lewis, an archaeologist participating in a symposium on wilderness fire in Montana, the use of fire was a tool in the tribal economy: "Indians did, of course, harvest large numbers of plants and animals that they influenced with burning. It was, after all, a hunting-gathering management program, not a fire management program" (1983:79).

Early explorers provided numerous accounts of Native Americans using fire as a weapon or to their advantage in conflict. The tribes would use fire to rob their enemies of tall grass in which to hide while

at the same time enabling the people to escape. Newly burned areas were advantageous in that they did not create noise that would notify their enemies of their approach (Pyne 1982:88). In one account, the people used fire to dissuade European explorers:

> …setting fire to the grass in the vicinity of the camp at night was one of the Indian modes of annoying a party too strong for attack and vigilant for a successful attempt at theft. [I had] been followed for days in succession by a party of Indians, who fired the grass to windward of my camp every night, forcing me to burn all around the camp every evening before posting sentinels… (Colonel Richard Dodge in Pyne 1982:73).

4.2. Maintaining and Influencing the Ecosystem

Native American groups recognized the benefits of seasonal ground fires for stimulating new growth and maintaining grassland areas. In fact, the abundance of open grassland surrounded by forests that were easily traversed is attributed in part to the burning cycles of Native American inhabitants. The people in the regions not only maintained grassland with fire, but they also created it. Even when intentional fires occurred every 10 to 20 years, it was enough to keep any forests at bay (Fisher et al. 1987; Steuter 1991). Pyne suggests that "with the exception of the High Plains, where the short grass expanses were more or less determined by climate, nearly all these [North American] grasslands were created by man, the product of deliberate, routine firing" (1982:85). Without intentional surface fires in these areas, the forests would have encroached on the prairies and the undergrowth would have been extreme (Pyne 1982; Day 1953; Arno 1985; Fisher et al. 1987).

Reasons for the use of fire to maintain and create grassland are many. Pyne suggests that intentional burns were used for the purpose of growing a fresh crop of grass for grazing and for the ease of travel. Long grasses afforded cover to enemies and inhibited swift escape. Overgrown forests were even more difficult to traverse and maneuver. Intentional fires used cyclically over the years kept the forested areas clear and created new growth in the grasslands (1982).

While Pyne asserts the great American grasslands were created by Native Americans, the use of intentional burning has been the topic of debate among ecologists and biologists studying ecosystem changes. A study performed at Devils Tower National Monument in Wyoming suggests an increased frequency of fire events during the same period the Sioux were moving into the area (ca. 1815–1873). The data was achieved through fire scar analysis and through the study of soilborne opal phytoliths (fossilized plant particles contained in rocks). According to the conclusions of the study, a dramatic shift in vegetation patterns within the last 100 years is probably due to this human manipulation of the environment. The Sioux entered the area around 1765, and by 1823 they occupied and controlled the area south of the Missouri River from the Black Hills to the Bighorn Mountains. The researchers discovered that, prior to 1770, fires occurred in the area about every 27 years. However, between 1770 and 1900 fire frequency increased to every 14 years (Fisher et al. 1987). Pyne suggests that the Apache and Sioux used fire more frequently and on a wider scale than other neighboring tribes (1982:79). The Sioux likely used fire in their hunting practices and would have used it to hunt buffalo.

4.3. The Spiritual Realm

The symbolic and spiritual importance of fire is not necessarily disconnected from its practical properties. Native American people understood that it was a sensitive resource provided to them from the Creator. In addition to the methods described above, fire is used in cleansing, healing, and renewal rituals and ceremonies. Father Pierre DeSmet, a Jesuit priest who ministered in Montana in the 1840s, observed:

> They attribute to fire a sacred character which is remarkable everywhere in their usages and customs, especially in their religious ceremonies. [Before] consulting the manitous, or tutelary spirits, or before addressing the dead, they began by kindling the sacred fire. This fire must be struck from a flint, or reach them mysteriously by lightning, or in some other way. To light the sacred fire with common fire, would be considered among them as a grave and dangerous transgression (Pyne 1982:80).

Fire is the quintessential symbol of the duality of nature. It can give life and just as quickly take it away. Fire is warmth and sustenance while at the same time destruction and death; it is purification and destruction. Fire provides a reminder of the fragile relationship between humans and the natural environment.

The spiritual realm of fire and its importance to Native Americans was a primary topic of discussion at the Camp Guernsey symposium and is presented in the next section.

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5. SYMPOSIUM COMMENTS, CONCERNS, AND ISSUES

From a management standpoint, protection of significant cultural resources from any damaging agent is a top priority, second only to human safety. Thorough planning is the fundamental first step in determining how to manage resources during a fire. As Winthrop explains: "Protecting cultural resources during fire begins with fire management planning. This is the place to define vulnerable cultural resources, appropriate protection measures for them, and appropriate management responses with regard to cultural resources in the event of wildland fire…" (2004:2). Resources can be damaged not only from the fire itself, but also from the efforts to control and suppress the fire.

The Native American view of wildfire management and cultural resource protection is notably different. While protection is a priority, the characteristics of such protection differ. For example, human attempts to control fire are seen as acts of arrogance that often result in more damage to the resources and the environment than necessary.

Native American participants spoke of the dichotomy of nature in presentations during the symposium. Mr. Dewey Tsonetokoy of the Kiowa Tribe of Oklahoma demonstrated how the things you learn to do with your hands and feet stay with you forever (Figure 5-1). He explained that what is learned through study and book learning is likely to be lost if it is not put into practice. Therefore, the traditions and characteristics that stay with you should be respected; the more book knowledge one obtains, the more arrogant one becomes, and one often loses the ability to respect the traditional way. He continued by suggesting that fire, earth, and water are resources that command respect. The use of these elements is something that is not learned from scholars. Mr. Tsonetokoy explained that wise men know they will never have the ability to control these resources, so when he uses them he must pray. Prayer shows respect to the Creator and the traditional way. Thus, in the Kiowa culture, a man who has forgotten to respect the power of fire and has tried to harness it for his own gain is arrogant and foolish. Furthermore, the man who has forgotten to give thanks and to pray when using these resources has become selfish in his pursuits and his actions are opposite of the traditional way. This behavior disregards the duality and risk associated with fire.

FIGURE 5-1. DEWEY TSONETOKOY, KIOWA, GIVES PRESENTATION AT SYMPOSIUM

Mr. Terry Grey of the Rosebud Sioux Tribe explained that the Lakota also believe in the duality of the world. There are two sides to everything: a forward reaction and a reverse reaction. Fire can be good and bad, sacred or not. He suggested that fire is a gift from the Creator and should be handled by those agents who have studied for years as fire keepers. Without the proper traditions and ceremonies, the power of fire transforms from good to bad.

Both men suggested that when confronted with a destructive fire, a tribal representative be asked to pray. In the event of a planned or prescribed fire, a designated representative should also be called on to pray prior to the ignition. In this way, the people will show their respect for the Creator, and balance can be maintained.

George Reed Jr. of the Crow tribe submitted an explanation of his culture's view about fire. He asked that it be included here:

> *Fire is sacred, why is it sacred? Fire is one of the most powerful forces on this earth whenever it is raging out of control, it is impossible for man to come to the rescue of fellow man. For this reason we do not play with fire. We make spiritual offerings of tobacco and meat to the fire, appeasing the Maker of fire before we bring live coals into our home for burning incense, and when we are through we return the coals to the fire. Before we start a ceremonial, religious, sacred and healing rite, prayers are uttered for the Power of our Creator to transcend through his creation to bring good fortune when this fire is used. The sacredness of fire stems from the power that encompasses the entire globe which permeates all living beings, all living things and all things in the universe. This power is in the air we breathe, the water we drink, the earth we walk on and the fire that keeps us warm. We use fire in our daily lives, our cultural religious, sacred and healing rituals. The Apsaalooke (Crow) fear fire because it represents death, whenever fire comes in contact with personal property and especially when a lodge burns down it is a bad omen personal possessions of deceased loved ones excluding sacred items are given to the fire because no one can claim them. Fires started as a means of survival are permissible but fires are not started for the simple fact of starting a fire. The origin of the Apsaalooke Sun Dance on Sheep Mountain began with a group of boys playing with fire. A natural clean even sweep of fire burning everything in its path is not as damaging as a fire that has fuel from fallen trees and piled shrubs which burns an area for any length of time. The wrath of nature is really the wrath of our Creator. Fire just as any other natural disaster such as earthquakes, hurricanes, tornados and forest and grass fires are all for a purpose. They are warnings that no one is heeding. These natural disasters will continue and they will worsen until someone realizes the abuse to the planet earth. How can you combat some power you don't believe in? Our ancestors knew how to appeal and control these powers long before the coming of the white race but with the introduction of their religions the abandonment of our belief-way and the discarding of sacred bundles this power is barely present. The indigenous peoples of this land knew this power therefore preserving the environment so the future generations yet to be born could enjoy their lives just as much as we did ours until the white society came and disrespected what we considered sacred. For the ones who still rely on our sacred healing ways fire as an integral part it cannot be disturbed during the actual healing ritual for a slight disturbance may cause repercussions. Nothing good will become of the effort.*

There was a difference in attitude and feeling among the tribal representatives when the causes of the two fires were discussed at the symposium. Although the Old Chicago Fire was more intense and burned longer than the Tracer Fire, it started from a lightning strike, a natural cause. The Tracer Fire drew criticism because it was started as a result of human activity. The consensus seemed to be that the Tracer Fire burned because of human arrogance and lack of humility for the resource. The possibility

that the Tracer Fire could have been prevented was a topic of discussion that concluded with the suggestion that people need to pay attention to conditions to avoid destructive events. The resulting damage is a testament of the power of fire and the arrogance of men.

Much of the discussion during the symposium surrounded possible avenues of protection and preventing fire damage to TCPs. These protection efforts need to take place before and during the threat from a wildfire. Planning and preparation avoids potential damage to TCP resources. Of specific concern was protection of sacred rock art panels. Based on the data presented, it was clear that any chemical retardants or suppression agents should not be used in the area of rock art.

Other recommendations included specific fuel reduction surrounding rock art panels, although it was noted that vegetation cover keeps the panel hidden from possible vandals. In order to prevent contamination, fuel reduction would require the use of hand tools by individuals with knowledge of the importance and sensitivity of the resources at the site. Some tribal representatives suggested that grazing animals might be a more natural option for controlling vegetation growth around rock art sites. The adverse effect of animals near rock art in contrast to the perceived benefit presents an interesting topic for discussion during a pre-fire consultation meeting.

Protecting rock art from heat, soot, and smoke damage was also discussed. A possible solution might be to have fire retardant fabric available to cover and protect the rock art in a wildfire situation.

Using controlled burns as a preventative tool was also suggested. This is based on the assumption that the controlled burn would burn less intensely than a wildfire would in the same area. Previously burned regions would be less likely to burn as intensely in future wildfires. It was suggested that any TCPs with high fuel levels or at a high risk of intense burning be considered in any controlled burn plans for the installation.

The development of fire-specific zones was discussed. These zones might include areas where no fire suppression activities are to take place, zones where no heavy equipment is allowed but where hand tools are permitted, and zones where no fire suppression restrictions are in place. The type of zone would be determined by the kind of resources within the area.

An advantage of developing fire-specific zones is that site sensitivity and confidentiality would be maintained. Protection efforts for TCPs would be sustained without compromising confidentiality. The importance of the interaction and communication between CRMs, Native American tribal representatives, and installation managers was noted. These zones would be created with input from the tribes in conjunction with consultation and the Section 106 process.

Of overall importance to the Native American participants in the symposium was the magnitude of involvement. Because of their distinct relationship to the resources of traditional cultural importance, it was strongly suggested that approved Native American representatives be dispatched as soon as a fire is reported. Once the fire event is over, consultation regarding any damage assessments and rehabilitation plans for the affected TCPs is also recommended.

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6. DEVELOPMENT OF THE STANDARD OPERATING PROCEDURE

SOPs are developed in order to complete a specific job safely, with no adverse effect on health or environment, and in a way that maximizes operational requirements. In addition, an SOP should provide all the necessary information to perform a job properly, with the highest quality, success, and consistency. Once completed, the SOP provides a historical record of how, why, and when the procedure took place (Friedman 1996). Based on the discussion throughout the DoD Legacy Program sponsored symposium, it was clear that the SOP for wildfires would be incomplete if it did not have three parts: Pre-fire, Fire, and Post-Fire. This SOP does not consider prescribed burn issues and procedures. However, planning at the installation level for prescribed burns can incorporate elements of this SOP for wildfires.

Throughout all stages of the SOP it is important to maintain confidentiality of TCP location, as well as any sensitive information regarding the sites themselves. Any maps with specific locational information about places of religious or ceremonial significance are maintained by cultural resource staff only. Maps with general locations and areas to be avoided will be provided to the incident commander.

6.1. Pre-Fire

This section of the SOP includes the work required for the subsequent processes to operate smoothly. The Pre-fire stage can take place any time, with updates as needed. These preparations should take place under consultation with installation managers and commanders, applicable Native American tribes, the state historic preservation offices, fire management teams, and any other subject matter experts.

The installation CRM would be responsible for developing and maintaining a list of sensitive sites with maps showing their locations. These site specific maps are for internal use only and issues of confidentiality remain a priority. Maps delineating potential protection zones as well as fire-specific zones should be available for distribution to the incident commander. These maps might include areas where fire breaks are located, areas of heavy equipment restrictions, as well as areas where no chemical agents would be allowed. This information should be kept as a hard copy and also as geographic information system (GIS) data as well.

The importance of identifying fire team personnel at the installation and maintaining communication with the CRM is intrinsic to the success of resource protection efforts. The CRM should encourage periodic meetings to share information and concerns about cultural resource protection in wildland fire events. The development of a communication process that will occur during a fire event, as well as how the SOP will work at the installation, will also take place during these meetings.

It is also recommended to create a list of red card archaeologists who would be qualified to be on the front lines of the firefight. The Incident Qualification Certification Card (red card) is held by individuals who obtain approved fire and emergency management training and pass required tests. The benefit of having red card archaeologists on the front line is their knowledge of cultural resources and their ability to communicate with the installation and fire-incident commanders in real-time situations (Horne and Winthrop 2005:5).

Furthermore, a list of qualified Native American fire representatives should be maintained for use in the subsequent sections. Determining who was or was not considered a “qualified” fire representative from the tribes was the subject of lengthy discussion during the symposium. The definition ranged from simply a person who cares and knows the traditional ways to a person in contact with the tribal government. The representatives in attendance felt confident that, if contacted, they could find a suitable

representative during a wildfire event. The representative would be a person who is reliable, dependable, and knowledgeable.

6.2. Fire

Because this phase of the SOP takes place during the fire event, all actions require swift planning and timing. Many of the required steps for this phase are dependent on the level of preparation in the previous stage. The qualified representatives will be notified, and suppression activities will involve consultation with the CRM and incident command level.

6.3. Post-Fire

Once the fire is completely contained, it is necessary to conduct a damage assessment in order to evaluate effects to TCPs and to mitigate and manage various resources. This assessment also begins the process of rehabilitation and stabilization. All the information known about the characteristics of the fire will determine how the resources are assessed for damage. In general, fires with an above-ground heat pulse will affect above-ground components, whereas fires with heat and convection pulsing down cause deeper heat penetration (Hall n.d.).

Damage assessments and any rehabilitation plans for TCPs should include consultation with qualified Native American tribal representatives. This would consist of a formal consultation meeting with field visits to the affected TCPs. The goal of the consultation would be to gather representatives from interested tribes to come to a consensus of suggested assessment and rehabilitation efforts. The CRM would then be able to make educated decisions regarding the actions taken at the TCPs after the fire, as well as future efforts to protect and preserve the sites. Feedback is essential in revising and creating management plans for the future (Look and Spennemann 2001:3).

The overall consensus of the group that attended the DoD Legacy Program sponsored symposium was the importance of consultation with the tribes in all aspects of planning prior to, during, and after wildfire incidents.

The following SOP provides recommendations for a process, provisions, and language that can be adapted or modified to meet the specific needs of an installation. It is important to consult with installation commanders and managers about the development of a wildfire SOP and obtain approvals prior to implementing the procedures. Consultation with state historic preservation offices, Native American tribal governments, and other federal and state agencies regarding the SOP is also recommended. The specific types of TCPs that are found on an installation will also influence the provisions needed in an SOP for the protection and damage assessments of these types of resources.

STANDARD OPERATING PROCEDURE

For

Protection and Damage Assessments
of Traditional Cultural Properties in Wildfire Events

[Note: Any threat to human safety supersedes the terms and limitations outlined in this SOP.]

Contact: Installation Cultural Resource Manager (CRM) (provide contact information)

Scope: This SOP outlines the steps to be taken in preparation for, during, and after a fire event affecting Traditional Cultural Properties (TCPs) located within military installation boundaries. The procedure in this SOP allows the CRM to determine appropriate actions in the event of wildland fire threatening identified TCPs and to coordinate the Native American consultation related to this action.

These procedures are intended to ensure tribal interests are considered in the protection, damage assessment, and possible rehabilitation of TCPs during all phases of fire planning.

Statutory References and Guidance

- National Historic Preservation Act (NHPA), 16 United States Code (U.S.C.) 470 et seq., 36 Code of Federal Regulations (CFR) 800
- Native American Graves Protection and Repatriation Act (NAGPRA), 25 U.S.C. 3001 et seq., 43 CFR 10
- Archaeological Resources Protection Act (ARPA), 16 U.S.C. 470 aa-mm, 43 CFR 7
- American Indian Religious Freedom Act (AIRFA), 42 U.S.C. 1996 (no implementing regulations)
- Indian Sacred Sites, Executive Order 13007
- Consultation & Coordination with Indian Tribal Governments, Executive Order 13175

Applicability: Any fire, controlled or wild, that poses a threat to identified TCPs.

PRE-FIRE

Procedure: The CRM shall do the following at the earliest possible point **IN PREPARATION FOR** an unexpected wildfire event:

1. Prepare and maintain a list of identified TCPs.
2. Prepare files for each TCP to include, but not limited to, the following:
   - site form
   - map and geographic information system (GIS) data
   - photographs
3. In consultation with tribes, determine appropriate suppression/protection efforts for each TCP and add to each TCP file.

4. In consultation with tribes, determine preventive measures for each TCP including (but not limited to) fuel thinning, the use of fire-retardant fabric, and prescribed burns.

5. In consultation with tribes, determine zones where specific suppression/protection efforts should be carried out. These general areas will be distributed to the incident commander and will be utilized in decision-making efforts.

6. Meet with installation fire team personnel to:

   - Discuss concerns about cultural sites protection in wildland fire events
   - Develop a communication process that will occur during an event
   - Discuss how the SOP will work at the installation

7. In conjunction with Range Management and/or Integrated Training Area Management, schedule any preventive measures for execution and maintenance (i.e., fuel thinning).

8. Prepare copies of maps to be distributed to the incident commander. Confidentiality of specific TCP locations should be maintained and where possible only the general area of sensitivity should be disclosed. Each map should show:

   - A generalized TCP area location
   - Roads and existing fire break locations
   - Vehicle staging areas
   - Boundary of restricted suppression efforts

9. Prepare and maintain a list of qualified tribal representatives to be notified in case of fire. The list should include:

   - Tribal affiliation
   - Title or position
   - Current contact information
   - Current information for a secondary tribal contact

10. Prepare and maintain a list of qualified red card archaeologists that can help on the front lines of the fire (refer to Horne and Winthrop 2005). The list should include:

    - Agency affiliation
    - Current contact information
    - Current red card status

11. Prepare and maintain a list of contacts as members of the installation Fire Management team.

12. Notify members of the Fire Management team with changes to CRM contact information.

DURING FIRE EVENT

Procedure: The CRM shall do the following at the earliest possible point **DURING** an unexpected wildfire event:

1. Begin the communication process previously established between the CRM and the installation Fire Management Team.
2. When notified of the fire, obtain as much information about the fire as possible and record it for future reference. This information should include, but is not limited to, the following:
   - How did it start?
   - When did it start?
   - Where is it burning?
   - What type of fire is it? Aerial, surface, ground?
   - Which direction is it moving?
   - How fast is it moving?
   - How intense is the burn?
   - What suppression efforts are being made?
   - Who is involved?
   - Are new hand or bulldozer fire breaks needed?
   - Where are vehicle staging areas located?
3. Determine if any TCPs are threatened.
4. Call tribal representatives:
   - Be prepared to list all the information known about the fire.
   - Make travel arrangements and accommodations.
5. Notify red card archaeologists:
   - Be prepared to list all the information known about the fire.
   - Assist in making travel arrangements and accommodations.
6. Collect the general TCP area files and make copies for distribution to Incident Commander.
7. Collect related maps and make copies for distribution to Incident Commander.
8. Communicate approved suppression activities with the Fire Management team.
9. Ensure communication of threatened TCPs to firefighters and leadership in the field, including any red card archaeologists.

10. Consult with tribal representatives regarding any action planned for the areas surrounding the TCP.

11. Notify state historic preservation office regarding the nature of the fire emergency and the threat to historic properties.

POST-FIRE

Procedure: In conjunction with the Section 106 and 36 CFR 800 regulatory process, the CRM shall do the following at the earliest possible point **AFTER** a planned or unexpected fire event:

1. Collect final information about the fire and record it for future reference and consultation purposes. This information should include, but is not limited to, the following:

    - How did it start?
    - When did it start?
    - Where did it burn?
    - How long did it burn?
    - How many acres were affected?
    - How fast did it move?
    - How intense was the burn?
    - What suppression efforts were used?
    - Who was involved?
    - Which TCPs were affected?
    - How deep was the ground disturbance?
    - Were any new cultural resources revealed?
    - Which tribal representatives were involved during the fire?
    - What rehabilitation and stabilization plans are being made?
    - When will the rehabilitation and stabilization plans be implemented?

2. Organize TCP damage assessment consultation meeting.

3. Contact tribal representatives for TCP damage assessment consultation meeting.

    - Make travel arrangements and accommodations.

4. Contact appropriate installation personnel for participation in the TCP damage assessment consultation meeting.

5. Field-check TCPs affected by the fire.

    - Take photographs.

- Record any changes or damage.
- Record any post-fire threats or stabilization needs.
- Update the site documentation forms to include any changes.

6. Organize a field visit to take place during the consultation meeting.
7. Organize and prepare for the TCP damage assessment consultation meeting. Topics of discussion should include, but are not limited to, the following:
    - Overview of the fire data.
    - Overview of the TCPs and the approved suppression efforts in the area of the TCP.
    - Discussion of any damage noted to the TCP.
    - Discussion of any post-fire threats, such as erosion, that may affect the integrity of the TCP.
    - Discussion of rehabilitation/stabilization options for the TCP.

The CRM will determine which recommendations to implement in the rehabilitation and stabilization effort at damaged TCPs, taking into account the opinions and recommendations of the Native American tribal representatives, and in consultation with the state historic preservation office and appropriate installation personnel.

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APPENDIX A: SYMPOSIUM PARTICIPANTS

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REGISTERED PARTICIPANTS IN THE CAMP GUERNSEY SYMPOSIUM: AFTER THE SMOKE CLEARS MAY 2–4, 2007

Joe Big Medicine - NAGPRA Representative, Southern Cheyenne
Floyd Osborne - Cultural Consultant, Eastern Shoshone
Dewey Tsonetokoy - NAGPRA Representative, Kiowa Tribe of Oklahoma
Linda Tsonetokoy - Representative, Kiowa Tribe of Oklahoma
Terry Gray - NAGPRA Coordinator, Rosebud Sioux
Robert Goggles - Cultural Consultant, Northern Arapaho
Burton Hutchinson Sr. - Cultural Consultant, Northern Arapaho
Edgar Bear Runner - Cultural Consultant, Oglala Souix
Cecelia Big Lake - Crow Nation
George Reed - NAGPRA Representative, Crow Nation
Wilfred Ferris - Cultural Consultant, Eastern Shoshone
Gilbert Brady - Cultural Consultant, Northern Cheyenne
Mark Owens - Senior Archaeologist, Fort Carson, CO
Pam Cowen - Cultural Resource Manager, Fort Carson, CO
Jeff Blythe - Cultural Resources, Fort Carson, CO
Ian Ritchie - Archaeologist Thunder Basin National Grassland and the Laramie Peak Unit of the Medicine Bow National Forest, WY
John Laughlin - Archaeologist, Wyoming State Historic Preservation Office
Fred Chapman - Archaeologist, University of Wyoming American Studies Program
Dave Reiss - Archaeologist, Office of the Wyoming State Archaeologist
Dan Wolf - Archaeologist, Office of the Wyoming State Archaeologist
Jeff Hokanson - Archaeologist, e²M
Alyssa Wright - Archaeologist, e²M
Karen Kempton - Cultural Resource Manager, Wyoming Army National Guard
Pamela McClure - Environmental Specialist, Camp Guernsey
Dave Palmer - NEPA Coordinator, Wyoming Army National Guard
LTC Bill McHenry - Environmental Section, Wyoming Army National Guard
LTC David W. Herder - Deputy Garrison Commander, Camp Guernsey
COL Tammy Maas - Construction & Facilities Management Officer, Wyoming Army National Guard
Dustin Kafka - ITAM Coordinator, Camp Guernsey
Dan Moss - Environmental Specialist, Camp Guernsey

Project Technical Advisors

Nelson Siefkin - Archeologist/BAER Coordinator, Fire Management National Park Service Pacific West Region, Oakland, CA

Claire Dean - Archaeological and Ethnographic Conservator, Dean & Associates Conservation Services, Portland, OR

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APPENDIX B: SLIDE PRESENTATIONS

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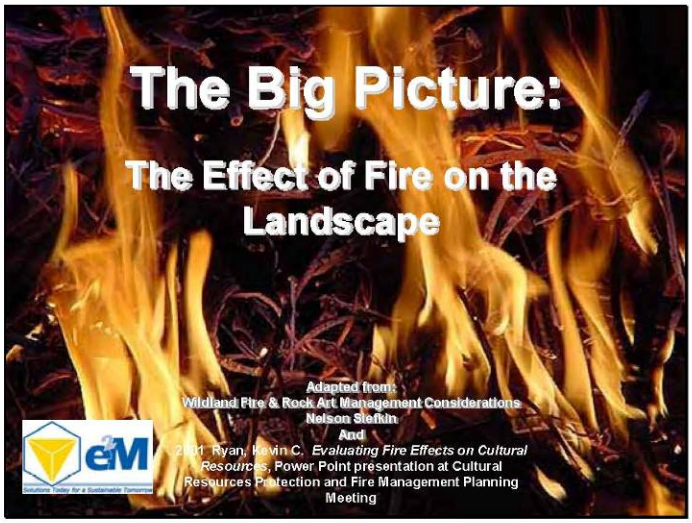
Slide 1



Slide 2

Introduction

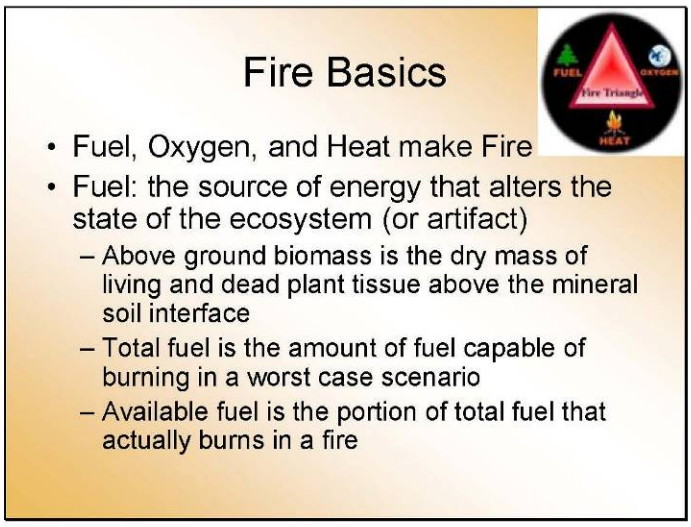
- Fire is an important ecological disturbance process.
- Past efforts to minimize fire impacts led to the accumulation of hazardous fuel levels.
- When wildfires occur resource managers need to predict where cultural resources are threatened and attempt to minimize the risk. They also need to assess the damage to resources after the fire.

Slide 3

Important Questions

- How hot will the fire get?
- How long will it be hot?
- Where are the cultural resources in relationship to the heat?
- Can those cultural resources, or the values associated with them, be adversely affected by the heat or the duration of heating, or by other components of the fire environment, like smoke?

Slide 4



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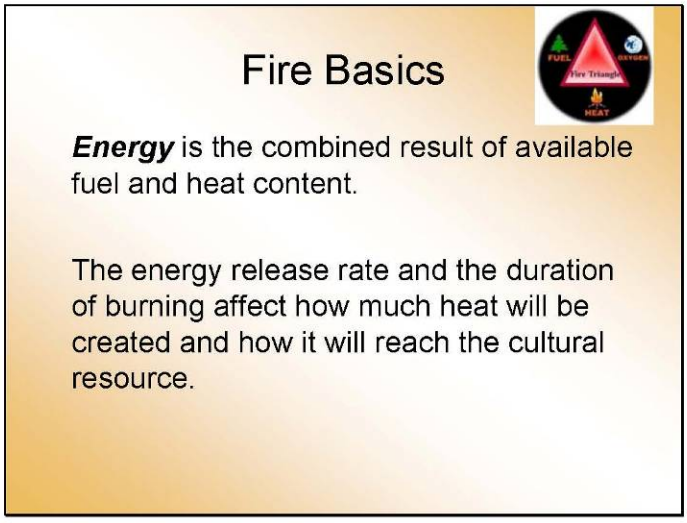

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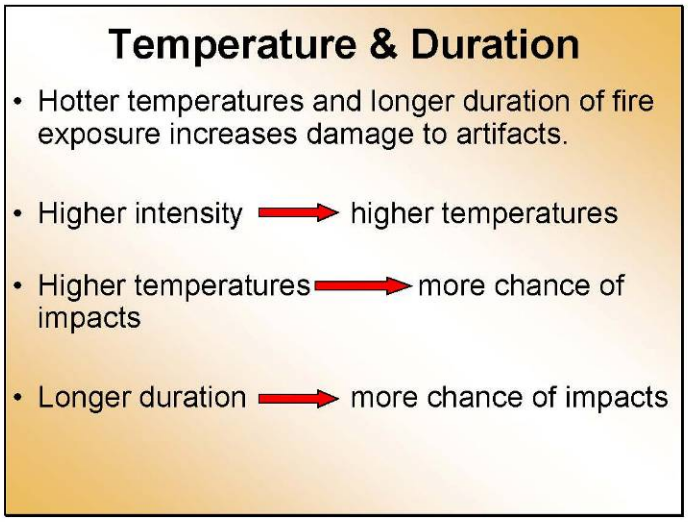

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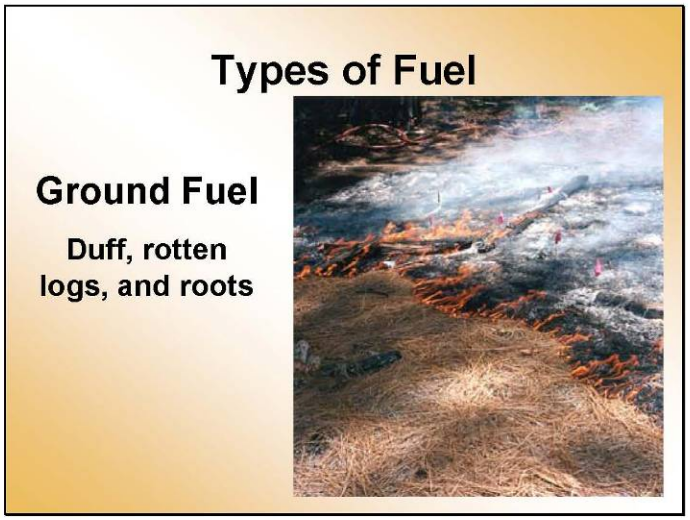

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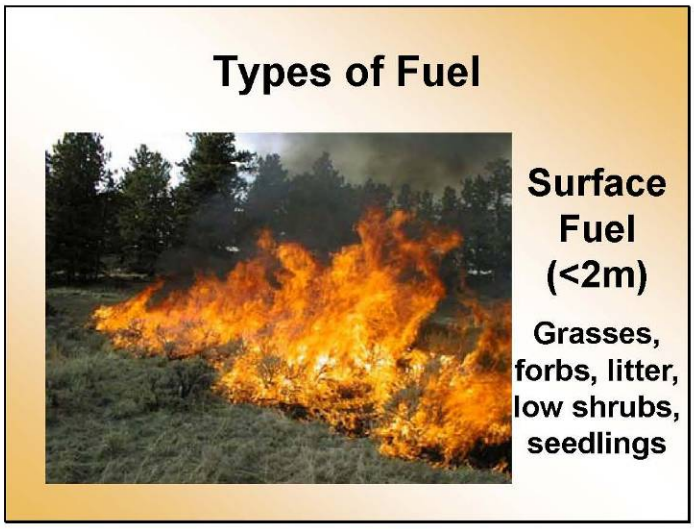

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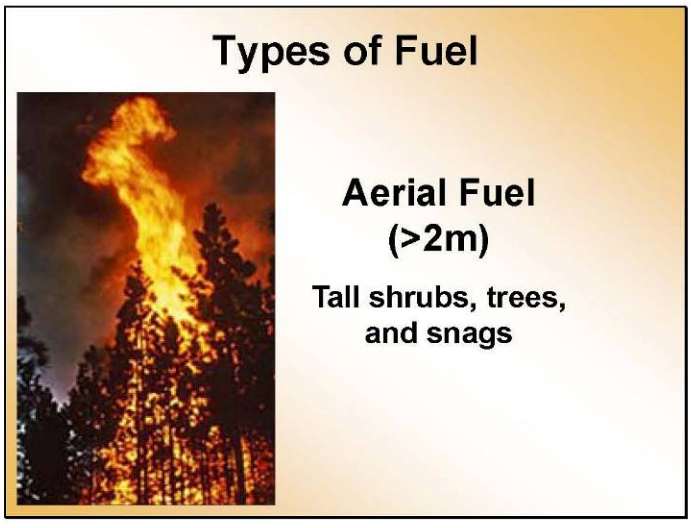

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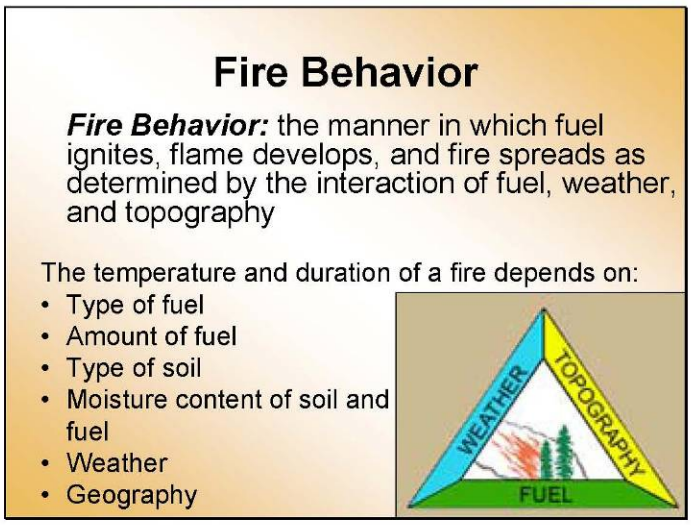

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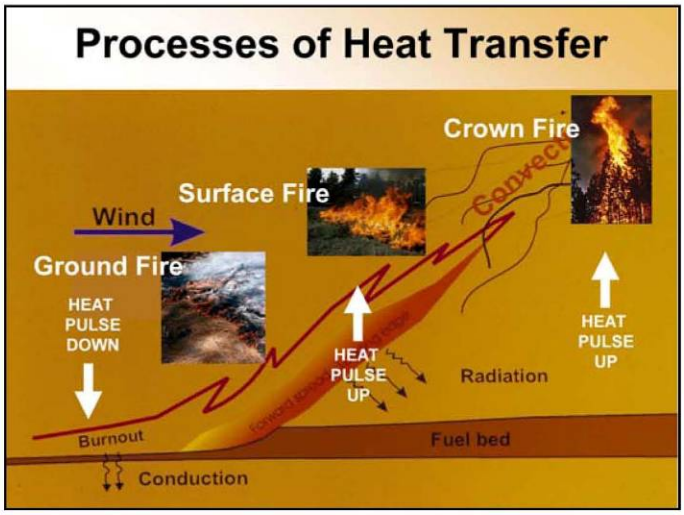
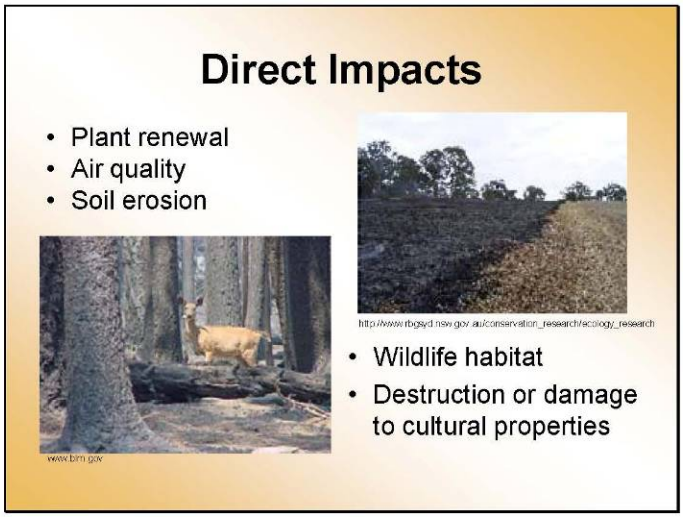


Slide 15

Fire Impacts

- ***Direct***: Fire itself is the cause of impacts…due to direct flame exposure, excessive radiant heating, smoke damage, etc.
- ***Operational***: Result from associated operations such as line construction, staging, etc. Especially common during the suppression of wildfires.
- ***Indirect***: Fire and/or associated operations result in a change in local context such that resources are effected, e.g., erosion, high tree mortality

Slide 16



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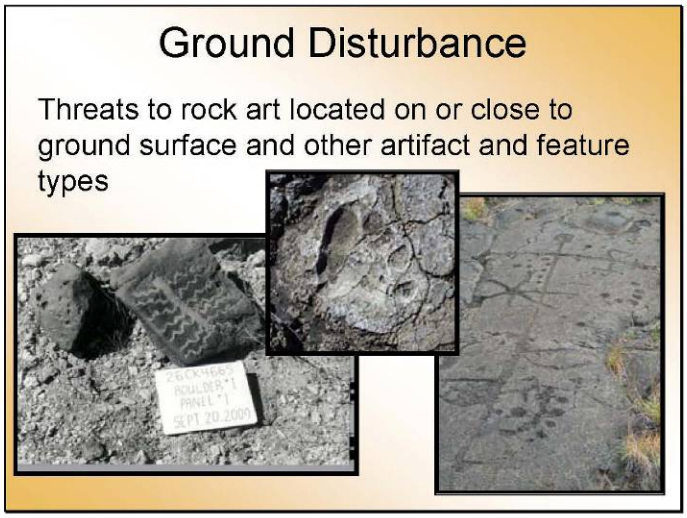

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Indirect Impacts
• Vandalism and looting of exposed cultural properties
• Damage to cultural resources caused by erosion

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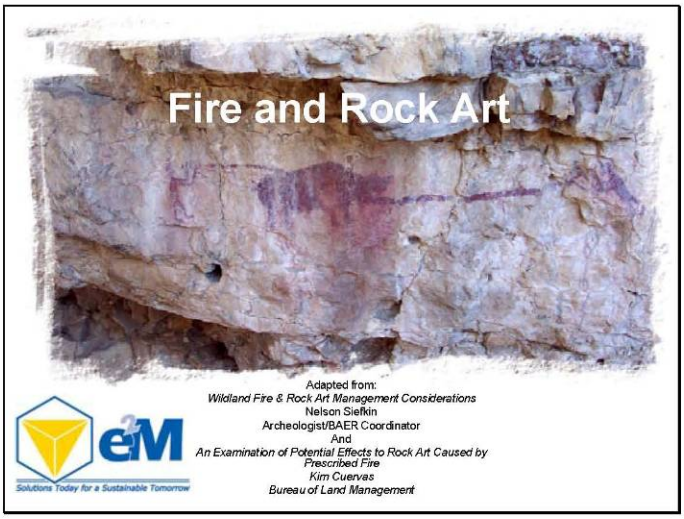

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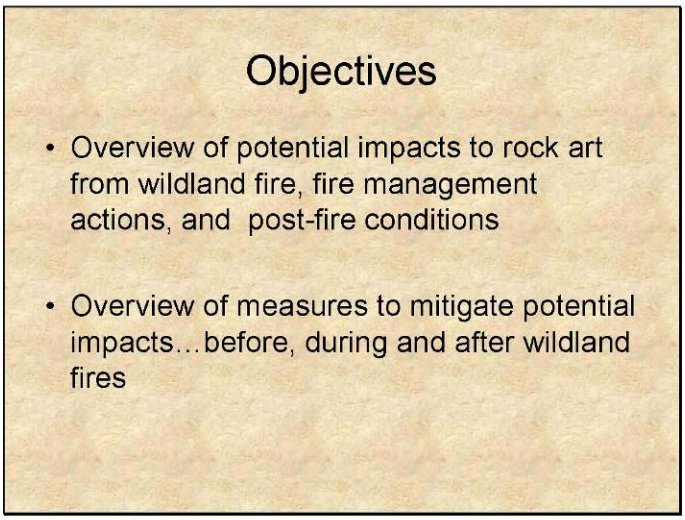

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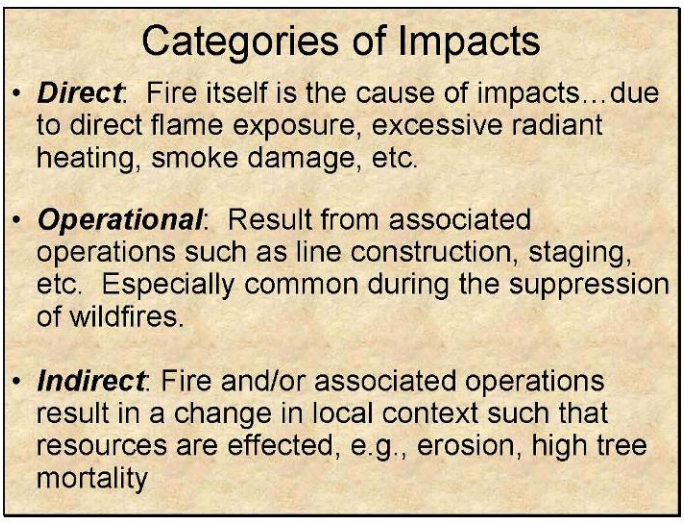

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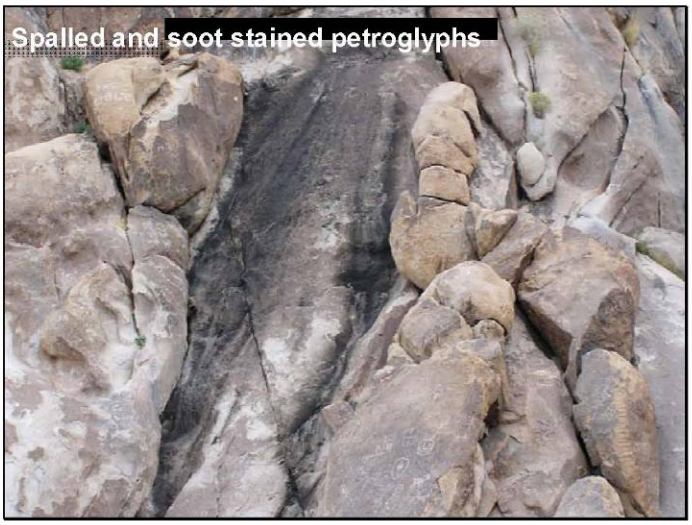

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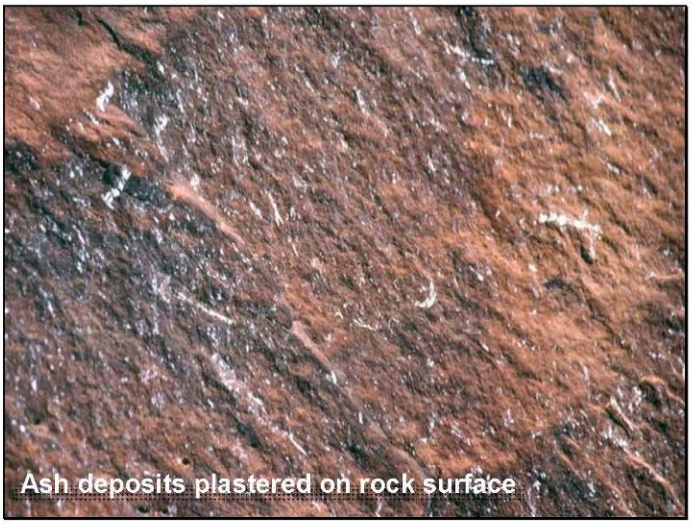

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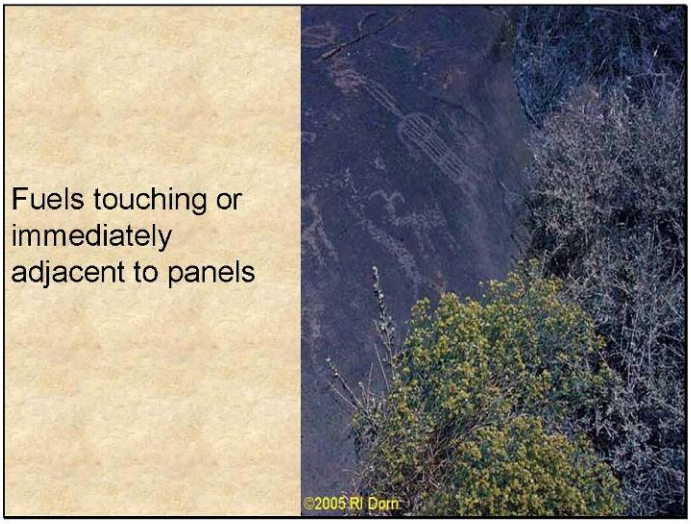

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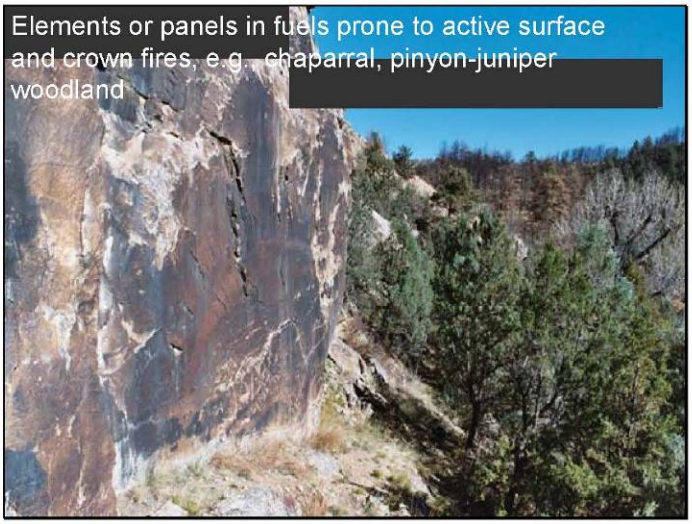

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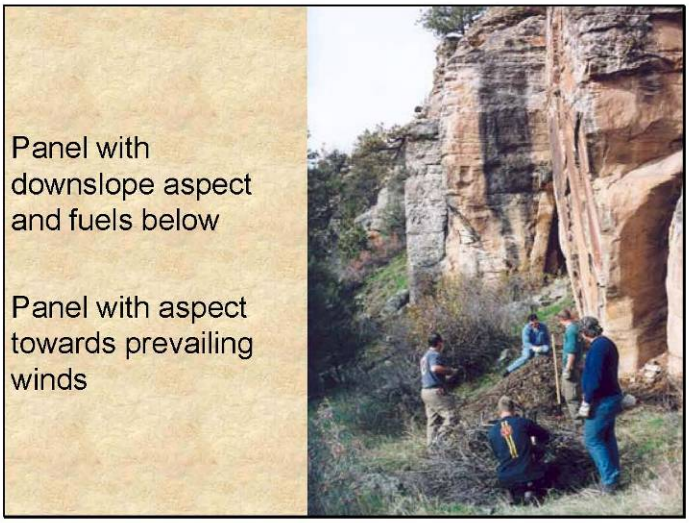

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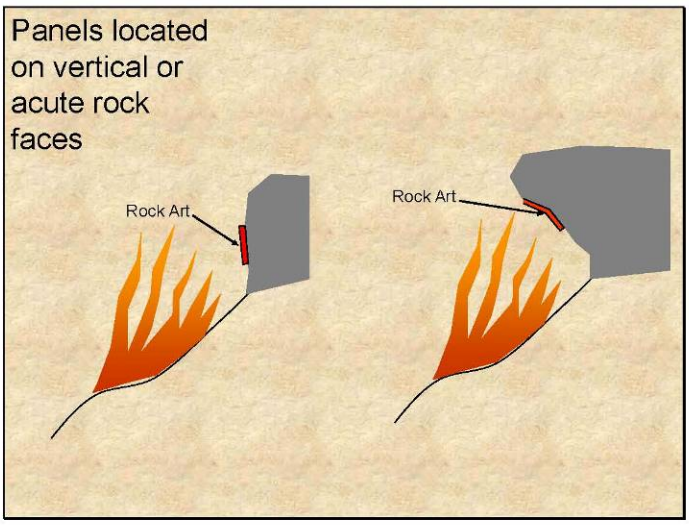


Slide 11

Panels located on rock substrates vulnerable to fire impacts

300-400°C – Basalt, andesite, porphyry begin to spall and fracture

>500°C – Quartz crystalline structure changes

Sandstones become highly friable when heated

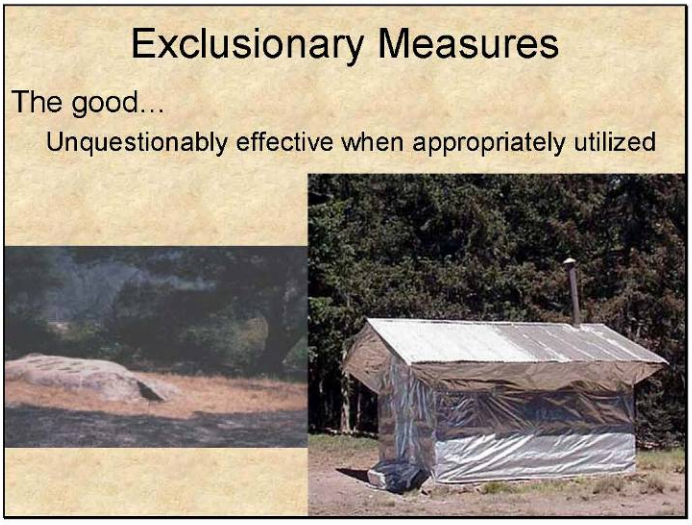
Slide 12

Mitigating Direct Impacts

Two strategies…

1. ***Exclusionary measures-*** preventing fire from burning on or in close proximity to a cultural resource through the use of some predetermined fire management action (e.g., fuel reduction, fire lines)
2. ***Non-exclusionary measures-*** predetermined fire management actions intended to produce fire intensities below that expected to cause resource damage (e.g., selective fuel reduction)…no intent to exclude fire altogether

Slide 13



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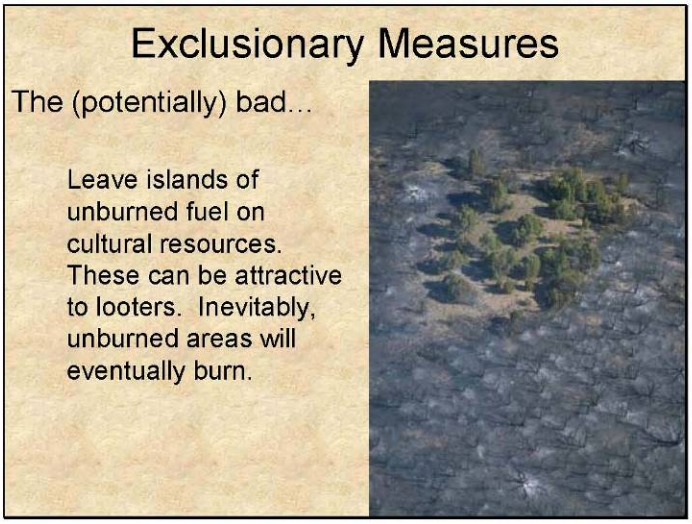

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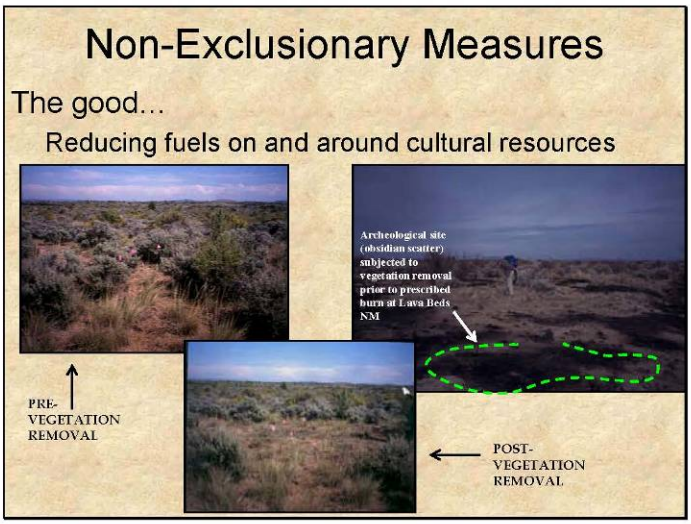


Slide 16

Non-Exclusionary Measures

The (potentially) bad…

Incomplete knowledge of fire effects and complexity of fire behavior

Slide 17

Fuel Reduction

- Includes removal of fuels immediately adjacent to rock art panels (generally through hand thinning) and landscape-level fuel treatments (prescribed burning, mechanical thinning)
- Feasibility and perhaps effectiveness enhanced if thinning is done in advance of any wildfires or managed fires

Slide 18

Fuel Reduction

- How much thinning is enough?
- Many experts seem to agree that 30-40 m. buffer from heavy, crown-fire prone fuels is sufficient
  - Maximum distance for radiant & convection heating impacts, direct flame impingement on homes
- Best to consult with fire management personnel in your area…know fuels and fire behavior, etc.

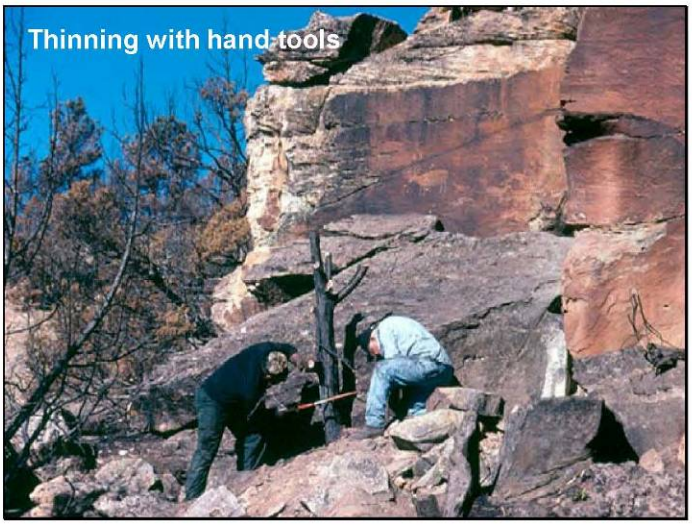
Slide 19

Fuel Reduction

Hand vs. mechanical thinning around panels

- Some experts advocate the use of hand tools only for reducing fuels directly adjacent to rock art panels…concern with carbon contamination
- Need to weigh amount of thinning required with contamination threat…options for protecting panels (tarps, fire shelters)

Slide 20



Slide 21

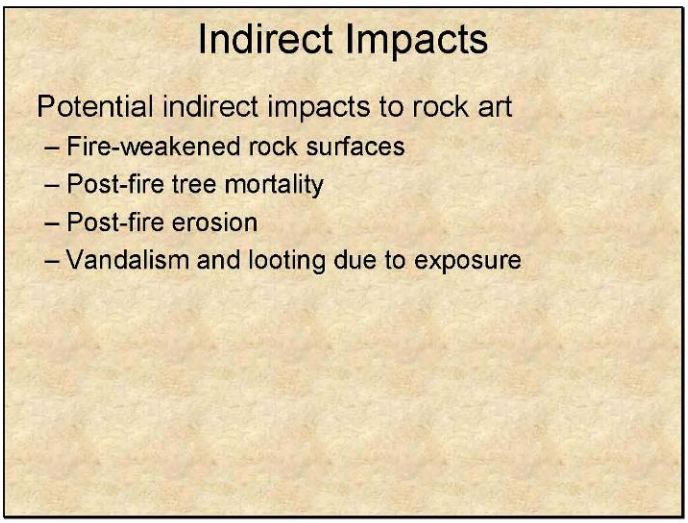
Fire Shelters

Drape fire shelter material over panel…good for heat and smoke

- Ensure material is securely fastened
- Best if done in conjunction with fuel reduction

Slide 22

Slide 23



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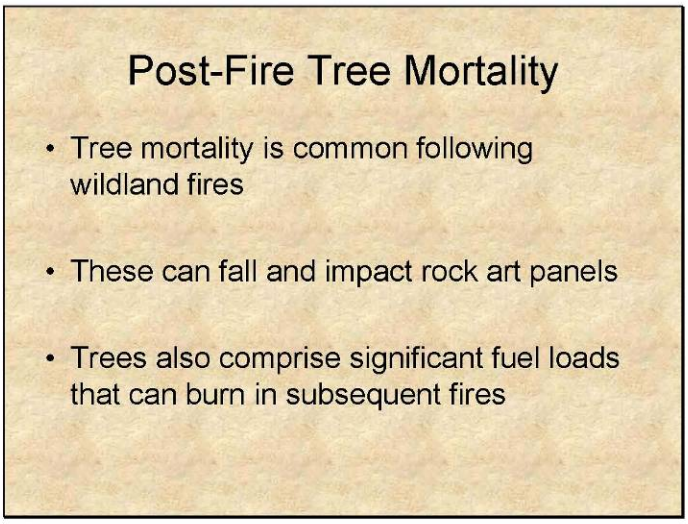

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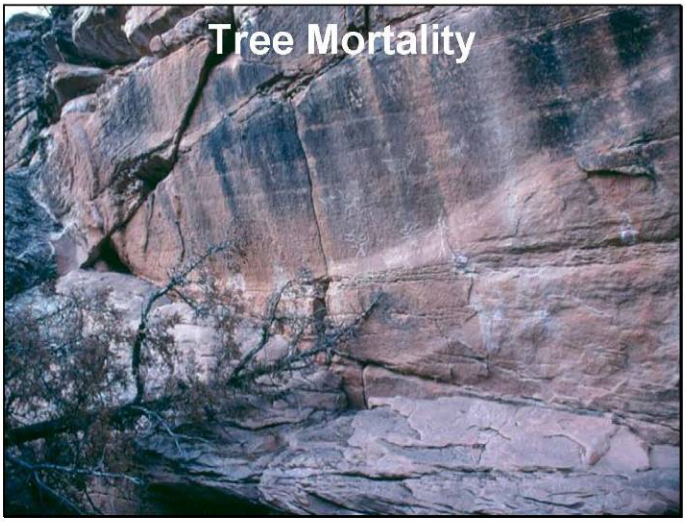


Slide 26

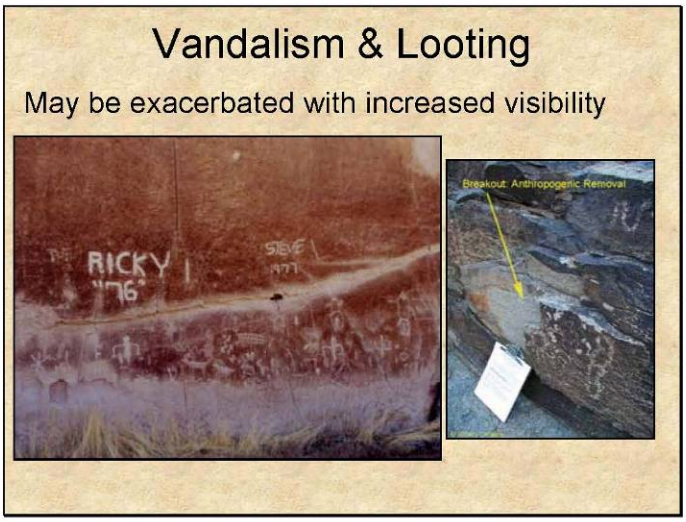
Post-Fire Erosion

- Erosion can increase significantly following wildland fires
- Mud-ash mixtures have been documented to flow over panels and become incorporated with and erode rock art elements
- Loss of vegetation around rock art sites can lead to dust storms, with potential for wind-caused erosion

Slide 27

Slide 28

Slide 29



Slide 1

Slide 2

Temperature & Duration

- Hotter temperatures and longer duration of fire exposure increases damage to artifacts.
- Higher intensity → higher temperatures
- Higher temperatures → more chance of impacts
- Longer duration → more chance of impacts

Slide 3

Fuel Type	Peak Temp (Surface)	Residence Time	Sustained Heating	Fire Impact (Artifacts)
Mixed Grass	100-300 C	10-20 sec	>50 C 3-6 min	Limited
Grass/Mixed Conifer				
(Grass)	100-300 C	10-20 sec	>50 C 2-4 min	Limited
(Grass/Litter)	250-500 C	5-15 min	>200 C 10-20 min	Moderate
(Log)	450-600 C	5-20 min	>450 10-20 min >200 C 1-2 hrs	Significant
Riparian				
(Grass)	100-200 C	10-20 sec	>50 C 1-3 min	Limited
(Willow Sm.)	100-300 C	1-2 min	>50 C 5-10 min	Limited
(Willow Lg.)	300-500 C	2-8 min	>100 C 5-30 min	Moderate
Sagebrush				
(Small-Med)	150-300 C	1-3 min	>100 C 5-10 min	Moderate
(Large)	250-500 C	2-4 min	>200 C 10-15 min	
Mixed Conifer				
(Duff/Litter)	200-400 C	1-2min	>100 C 3-10 min	Moderate
(Log)	400-800 C	5-20 min	>300 C 20-40 min 100-200 C 2-4hrs+	Significant
Piñon-Juniper				
(Large Litter)	700-800 C	2-4 min	200-400 C 1hr+	Significant

n.d. Siefkin, Nelson *Wildland Fire & Rock Art Management Considerations*

Slide 4

Fire and Obsidian

- Fire can damage hydration bands
- Does not damage source analysis
- High temperatures cause obsidian to bubble, crack and lose hydration

Slide 5

Obsidian

Temperature	Effect
300°C (572°F)	Hydration band begins to become diffuse
400°C (752°F)	Hydration band not visible
450 – 800°C (842 – 1472°F)	Enhanced fracture lines
760°C (1292°F)	Obsidian may melt

2004 Winthrop, Kate *Bare Bones Guide to Fire Effects on Cultural Resources For Cultural Resource Specialists*, Bureau of Land Management

Slide 6

Chert

- Fracturing
- Pot-lidding
- Crazing
- Shattering
- Change in color and luster

2004 Winthrop, Kate *Bare Bones Guide to Fire Effects on Cultural Resources For Cultural Resource Specialists*, Bureau of Land Management

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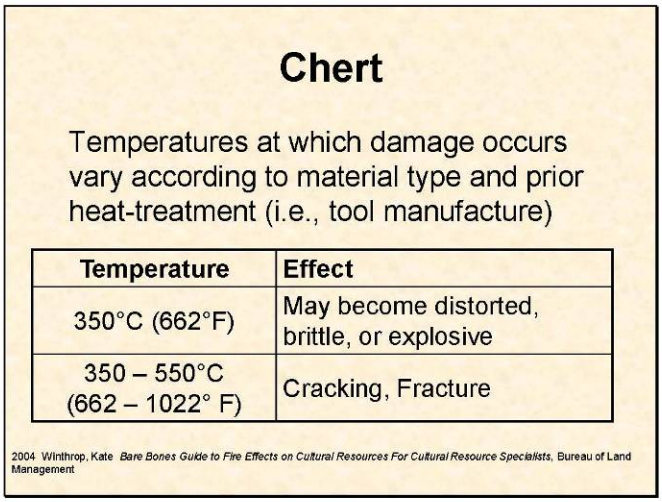

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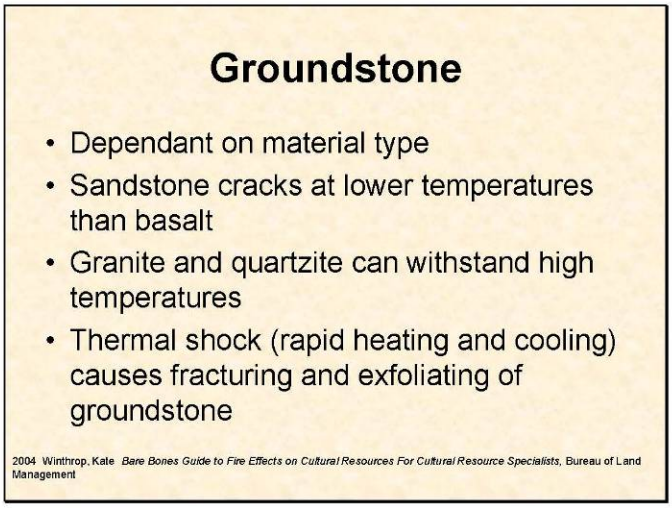

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