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***Title* Cultural Resources and Recreational Trails Use at Los Alamos
National Laboratory, Los Alamos, New Mexico:
Education and Mitigation**



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Cover photo: Well-worn trail segment built in Technical Area 71 by local residents.

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Introduction

This paper represents an analysis of the impact of social trail usage on historically significant cultural resources in Technical Areas (TAs) 70 and 71 at Los Alamos National Laboratory (LANL) in northern New Mexico. TA-71 is situated immediately adjacent to and south of the community of White Rock and TA-70 is directly south of TA-71 (Figure 1). This research was conducted to support the Mitigation Action Plan associated with a 2003 Environmental Assessment (EA) titled *Environmental Assessment for the Proposed Los Alamos National Laboratory Trails Management Program, Los Alamos, New Mexico* (DOE/EA-1431). This EA elicited more than 125 comments primarily from residents of Los Alamos and White Rock communities. Trails use in general is important to members of these communities; however, the cultural resources situated within these areas are also points of interest and respect. When the Mortandad Cave Kiva trail, closed to prevent damage to this important cultural resource, was opened to the public during the 2007 New Mexico Heritage Month more than 1000 visitors participated in guided tours organized by the Trails Assessment Working Group and LANL's Cultural Resources Management Team (Figure 2). Unfortunately, recreational trails use is sometimes associated with detrimental effects to trail segments and cultural resources. The effects of recreational trails use and LANL mission operations are the focus of the analysis presented in this paper.

1.0 Trails Use and Cultural Resources

On September 2, 2003, the Los Alamos Site Office of the Department of Energy, National Nuclear Security Administration issued an EA pertaining to the evaluation and management of social trails at LANL. Since the establishment of LANL in 1943, employees and members of the Los Alamos and White Rock communities have unofficially used portions of LANL for recreational ("social") purposes. One of the most popular manifestations of this is the use of existing trails, some associated with the ancestors of San Ildefonso and Santa Clara Pueblos and some established by the Los Alamos Ranch School, and the development of new trails for walking, jogging, horseback riding, mountain biking, and other forms of recreation.

In response to the 2003 EA, LANL established the Trails Assessment Working Group. This Group has provided a forum for members of the neighboring Pueblos, the public, Los Alamos County, the Department of Energy, the Laboratory, and others to discuss their concerns related to trails use and to more actively manage LANL's large system of trails. The data presented here originated during a management assessment of the trails situated in TA-70 and -71.

Pedestrian surveys conducted in these areas included collection of global positioning system (GPS) data for all identified trail segments in the area. Surveyors, referred to throughout this document as "assessors," recorded impacts to archaeological sites affected by recreational trails use, as well as to the trails themselves. Some of the impacts were a result of long-term trails use and mission-related activities (e.g., erosion). Others were more recent (e.g., the creation and use of two-track roads, modern camping, pot hunting/looting, and vandalism). Specific damage to sites and trail segments is discussed in subsequent sections, as are recommendations for cultural resources management strategies, site stewardship opportunities, and trails use.

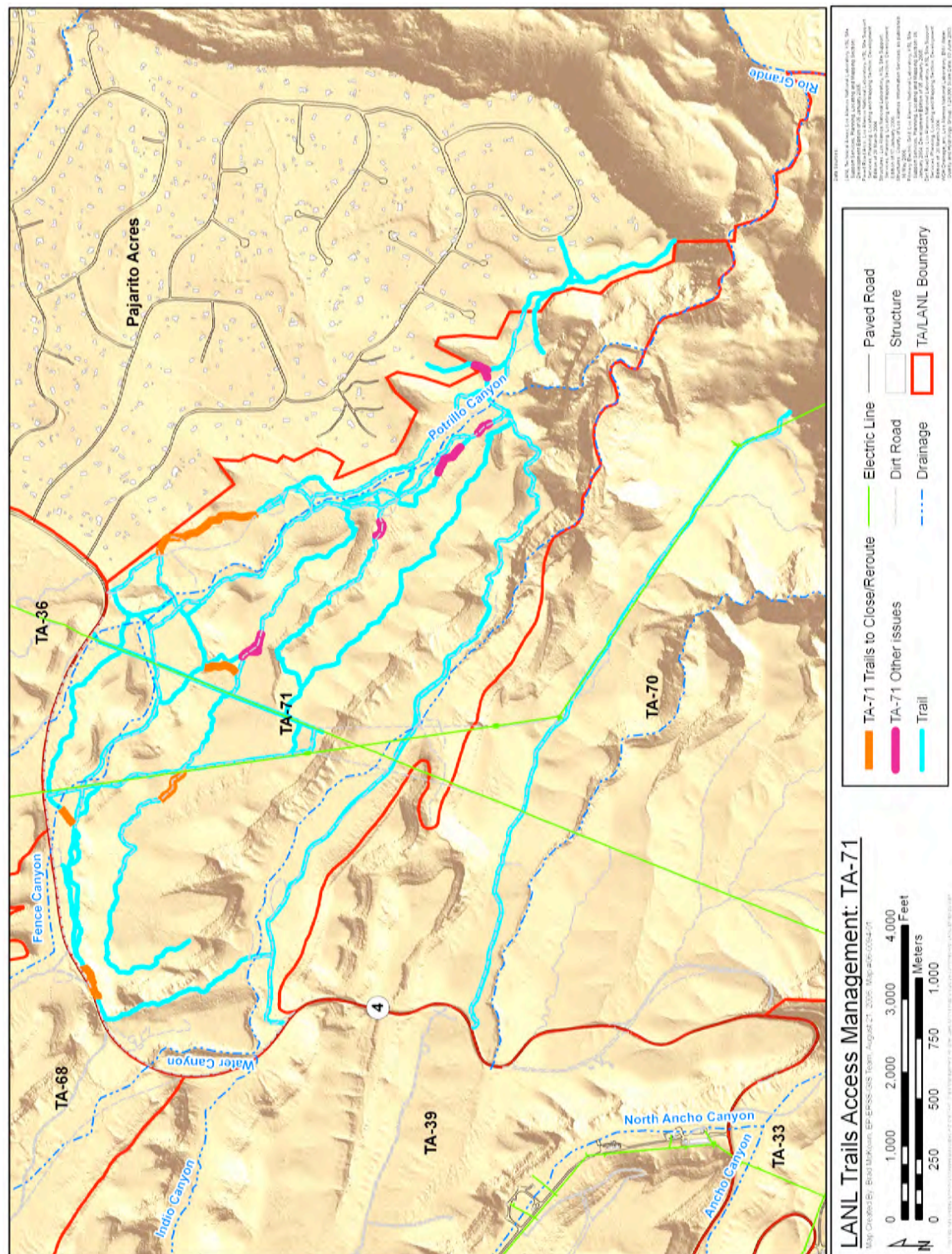


Figure 1. TA-70 and -71 situated at LANL in northern New Mexico.



Figure 2. Visitors participate in the 2007 New Mexico Heritage Month tours of Mortandad Cave Kiva trail.

2.0 A Brief Culture History of the Pajarito Plateau

LANL manages more than 2000 cultural resources in accordance with various Federal laws (e.g., the Native American Graves Protection and Repatriation Act and Section 106 of the National Historic Preservation Act). Sites situated within the LANL boundary date as far back as 5500 BC, during a period referred to as the Archaic period, and are as recent as the 1940s and 1950s (Table 1). The most recent sites are the historic buildings associated with the Manhattan Project and the Cold War (Vierra and Hoagland 2000). Ancient and Ancestral Pueblo sites at LANL include large lithic and/or ceramic scatters, rock shelters, pueblo roomblocks, and cavates (Vierra and Hoagland 2000; Vierra et al. 2002). After the Archaic period, the Plateau was home to Ancestral Pueblo people whose descendants still live in the area today. The areas discussed in this paper were occupied as early as the Archaic period and more recently by Ancestral Pueblo peoples. Ancestral Pueblo sites date to as early as AD 900 to as late as AD 1500. Cavates, ancient trail segments, one- to three-room fieldhouses, and pueblo roomblocks dating to the Coalition and Classic periods have been identified during previous surveys. These sites provide LANL's cultural resource managers with a better understanding of the lives of Ancestral Pueblo peoples (Vierra and Hoagland 2000; Vierra and Schmidt 2007). In particular, ancient trail segments provide archaeologists with information regarding ancient travel and trade routes as well as about inter-site relationships among people living on the Pajarito Plateau. For this reason, the archaeological record provides information about the ways in which people living on the Pajarito Plateau interacted and moved across the landscape.

**Table 1. Temporal Sequence Associated with Sites
on the Pajarito Plateau Included in This Study**

Cultural Affiliation	Period	Dates
Archaic	Jay	5500–4800 BC
	Bajada	4800–3200 BC
	San Jose	3200–1800 BC
	Armijo	1800–800 BC
	En Medio	800 BC–AD 400
	Trujillo	AD 400–600
Ancestral Pueblo	Early Developmental	AD 600–900
	Late Developmental	AD 900–1150
	Coalition	AD 1150–1325
	Classic	AD 1325–1600
Native American, Hispanic, and Euro-American	Spanish Colonial	AD 1600–1821
	Mexican	AD 1821–1846
	U.S. Territorial	AD 1846–1912
	Statehood to World War II	AD 1912–1945
	Recent	AD 1945–present

3.0 Assessment Methodology

In 2005 and 2006, LANL survey teams, which included members of the Trails Assessment Working Group and the Ecology and Air Quality Group, evaluated sites situated in TA-70 and -71 to quantify impacts from social trails use on cultural resources in areas used by the public. As previously stated, the assessors used GPS units, forms, and digital camera pictures to record site impacts and trail use issues. Assessors used the Trail Cultural Resource Impact Field Record Form (Figure 3) to document their findings.

The assessment form includes an area for notes, which in some cases was used to record information about Ancestral Pueblo trail segments that have been subject to continual use for hundreds of years. In general, archaeological site locations in these areas had been recorded previously as part of other projects (e.g., Hoagland et al. 2000; Nisengard et al. 2002; Vierra 2000). Many of the sites were relocated using a GPS unit; some were marked with string and flagging tape during the Laboratory’s tree thinning project in 2001 and 2002 and were relatively easy to relocate. The string and flagging tape made the sites visible to tree thinners, protecting the sites from damage during mechanized tree falling and other thinning activities; however, they also made the sites more visible to hikers and would-be collectors. In some places, Ancestral Pueblo trail segments were integrated into the modern hiking, biking, and horseback riding trails used by residents of White Rock and Los Alamos, as well as by visitors to the area. In recent years, these areas have been closed at times of the year due to wildfire restrictions.

TRAIL CULTURAL RESOURCE IMPACT FIELD RECORD FORM	
TECH. AREA #:	___ DATE: _____ TRAIL/SEGMENT: _____
RECORDERS _____	Collection: ___ No; _____ Yes(#)
GENERAL DESCRIPTION OF TRAIL SEGMENT: _____ _____	
NUMBER OF IMPACTED ARCHAEOLOGICAL SITES ALONG TRAIL SEGMENT: _____	
DESCRIBE TRAIL IMPACTS BY INDIVIDUAL ARCHAEOLOGICAL SITE:	
SITE #: LA _____	Temp or other No: _____ Site Type: _____
Erosion: ___; Vandalism: ___; Modern Trash: ___; Camping: ___; Pot-hunting: ___; Other: ___	
General Comments: _____ _____	
Photos: <u>(Camera Name)</u> _____	
GPS: <u>(Unit)</u> _____	
Recommendations: Reroute Trail ___; Erosion Control: ___; Close Trail Segment: ___; Other: ___	
Discussion: _____ _____	
SITE #: LA _____	Temp or other No: _____ Site Type: _____
Erosion: ___; Vandalism: ___; Modern Trash: ___; Camping: ___; Pot-hunting: ___; Other: ___	
General Comments: _____ _____	
Photos: <u>Camera Name:</u> _____ <u>Photo Numbers:</u> _____	
GPS : <u>(Unit)</u> _____	
Recommendations: Reroute Trail ___; Erosion Control: ___; Close Trail Segment: ___; Other: ___	
Discussion: _____ _____	

Figure 3. Trail Cultural Resource Impact Field Record Form.

4.0 Findings and Recommendations

Assessors in TA-70 and -71 identified three primary impacts to cultural resources, including Ancestral Pueblo trails, resulting from recreational trails use. These three in order of frequency are erosion (Figure 4), site looting (Figure 5), and vandalism and/or modern disturbances (Figure 6). Natural erosion, from wind and water, accounts for the majority of site and trail impacts in these areas. In some cases, recreational, grazing, and LANL mission activities—including the

use and construction of two-track, power line, and fire roads—have exacerbated the impacts of natural erosion. Figure 4 illustrates damage to a trail segment and an artifact scatter resulting from construction of a power line. The effects of erosion can be mitigated to some degree with better land management methods and erosion controls incorporated into LANL projects.



Figure 4. Erosion impacts to a trail segment and a Coalition period artifact scatter.



Figure 5. Evidence of looting at a Coalition period site adjacent to a trail segment.



Figure 6. A two-track road runs through a Coalition period roomblock (shaped tuff blocks from the site line the side of the road).

Looting of archaeological sites (Figure 5) has also been an issue in these areas, although it is rare, as recreational trail segments sometimes cross through site boundaries. In most cases, looting activities include manual excavation of Ancestral Pueblo sites resulting in depressions in the centers of masonry rooms and the pushing aside of masonry blocks in an attempt to retrieve artifacts. Disturbance of cultural resources ultimately results in their destruction, as stratigraphic and contextual information is lost when the contents of these sites are ransacked. Recreational trails users and mission-related activities at LANL sometimes impact archaeological resources unintentionally; however, results of these activities are also detrimental to these resources.

Assessors evaluated trail segments and recommended some form of treatment, including closure, future monitoring, erosion control, site excavation, and string removal for about 50 percent of the sites (Nisengard et al. 2006). Examples of site and trail impacts are presented below with photographs of damage. Specific locations of the segments are not illustrated in this report to protect cultural resources.

The trail segments and associated cultural resources included in this section were recommended for some treatment. Impacts to the site include scattered modern trash, a recent campfire, a road that cuts through a portion of the site, and low-level erosion (Figure 7). Erosion has resulted in areas of exposed bedrock. Because the site is a relatively dispersed artifact scatter, assessors recommend future site monitoring. Monitoring will help keep a record of further impacts and will allow assessors to alter their recommendations if additional treatment becomes necessary.



Figure 7. Trail segment and archaeological site with remnants of a modern campfire within the site boundaries.

As previously stated, erosion is the most significant impact to many of the trail segments in this study. A Coalition period one- to three-room structure was affected by erosion directly to the east and west of the site boundary (identified with string and pink flagging tape in Figures 8 and 9). Assessors recommended rerouting trail segments and erosion controls along incised trail segments to protect sites and trail segments from further erosion.



Figure 8. Trail segment and Coalition period site with impacts from erosion.



Figure 9. Effects of erosion and trails use at a Coalition period roomblock.

In some portions of the study area no cultural resources were present, however, assessors recommended erosion controls and rerouting of segments due to extreme impacts from erosion (Figure 10). In these areas, further erosion will occur if the trail is not rerouted and could ultimately present a safety issue.



Figure 10. Heavily eroded trail segment.

In some places, multiple trail segments cut through sites (Figure 11). An absence of sherds and lithics on large Ancestral Pueblo sites is indicative of casual collection activities. At large sites with these issues associated with trails use, assessors do not recommend relocating the trail segments, but suggest continued site monitoring.



Figure 11. Assessors record impacts to a large Coalition period roomblock.

Some sites have evidence for extensive looting, one such site is a large Coalition period pueblo complex (Figure 12). At the site, two old looters pits appear to have been filled with masonry blocks (Figure 13). Trail segments bisect the site and assessors recommend relocation of the trail to prevent further damage to the site.



Figure 12. S. Sherwood records impacts to a Coalition period pueblo. Masonry blocks at the bottom of the picture indicate intact archaeological deposits.



Figure 13. S. Sherwood assesses a trail segment—in the foreground is a cluster of masonry blocks, evidence of looting.

In the areas described in this paper, modern recreational trail segments sometimes intersect ancient trail segments. The age of these trails usually corresponds to degrees of erosion. Age, combined with recreational use, and natural erosion are reflected in a trail's appearance (Figures 14 and 15). In areas where it is possible, assessors recommend rerouting portions of these segments to preserve the Ancestral Pueblo trails.



Figure 14. An eroded portion of an Ancestral Pueblo trail segment.



Figure 15. Ancient segment to be closed and the trail rerouted.

Recent tree falls and casual erosion controls have impacted several trail segments. In TA-71, when a tree fell in one area and crossed the trail, users rerouted a portion of the trail and began to use the “bypass” route as an alternative (Figure 16). Bypass routes are sometimes created as horse jumps or to discourage the use of multiple trail segments (Figure 17).



Figure 16. Bypassed portion of a trail segment—area blocked off with tree branches is circled.



Figure 17. Masonry blocks used to reroute trail segment 14-J after a tree fall.

In almost all cases, assessors recommended removal of the perimeter string from sites with a line of sight from a recreational trail because it appears that artifacts have been collected from the site, as assessors were unable to identify any artifacts on or adjacent to these trail segments. As shown in Figure 18, perimeter string is also recommended for removal because it sometimes impedes natural processes.



Figure 18. Tree fall on string surrounding site.

In some cases, assessors identified previously unrecorded sites like the one pictured in Figure 19, thought to consist of two roasting pits next to a well-used trail segment. The roasting pits are relatively ephemeral and, in this situation, assessors recommended excavation of the two features to avoid further deterioration by erosion and trails use.



Figure 19. Assessors record a trail segment and two possible roasting pits.

Assessors suggest that looting at some sites has occurred within the past five years (Figure 20). At one site, looters excavated the center of the structure, pushing masonry blocks out to the sides and removing any artifacts that may have been associated with the site. Removal of the perimeter string will help prevent easy identification and further damage.



Figure 20. S. Sherwood records impacts to a trail segment and a looted structure.

Collection impacts to a site may not come in the form of site looting, but rather may result from what archaeologists call “casual collection” activities. A Coalition period Ancestral Pueblo roomblock situated in TA-70 to the north of a trail segment has been subject to this activity. The roomblock is not bisected by the trail and the site has not been impacted by trails use per se. However, the roomblock is devoid of all artifacts, including ceramics and lithics, which is unusual at a Coalition period site of this size and is usually indicative of casual collection of artifacts by visitors to the area.

5.0 Future Recreational Trails Use at LANL

As previously stated, a majority of impacts to trail segments and cultural resources result from natural erosion. This impact can be mitigated to some degree with erosion control methods and better land management in the area, some of which could be done as a part of LANL missions, others of which will be done at the grassroots level. Other kinds of impacts, including modern disturbances, camping, looting, and vandalism, are relatively rare and areas accessible to the public are subject to self-monitoring by those who use them. Recreational trails users, in general, treat areas where they have public access with a great deal of respect. In addition, grassroots trails maintenance on LANL lands is done by the recreational trails users (e.g., hikers, bikers, horseback riders) in hopes of preserving access to these areas and protecting associated resources. Trail users, including LANL workers, have a documented history of notifying LANL’s Environmental Protection Division when they witness vandalism, safety issues, and/or misuse of natural and cultural resources. In the majority of situations, when mitigation was necessary, assessors suggested rerouting trails, erosion control, and, in a few worst-case scenarios, closure of specific trail segments. Trail segments were recommended for closure when they posed safety threats to users and when substantial threats to cultural resources have or will occur.

In some cases Ancestral Pueblo trails have been incorporated into the recreational trails network. While there are some examples of heavily eroded trail segments, many of these trails are in excellent condition (Figure 21). In such cases, it is not always realistic to suggest rerouting these segments, as doing so could jeopardize both the cultural resources and user safety. LANL’s Trails Assessment Working Group in concert with Los Alamos County has organized trails maintenance volunteer work parties (Figure 22). These work parties provide a venue for all interested members of the Los Alamos community to actively participate in protecting, restoring, and educating others about the important role the Los Alamos trails play in the lives of those who live in and visit the community. The Trails Assessment Working Group continues to work with members of Los Alamos County, members of San Ildefonso and Santa Clara Pueblos, and the public to understand the concerns of trail users and those of the descendants of Ancestral Pueblo peoples.



Figure 21. S. Sherwood stands next to an Ancestral Pueblo trail segment.



Figure 22. A volunteer work party rehabilitates the historic Hidden Canyon Trail.

In the past, specific trail segments have been closed in response to security concerns and to protect and preserve archaeological resources (e.g., Mortandad Cave Kiva trail). However, trail closures are not the only option. In fact, places like those discussed in this paper provide examples of recreational trails use that is beneficial to all parties. Such use contributes to the maintenance and preservation of natural and cultural resources and provides opportunities for LANL and non-LANL residents to better understand and appreciate these kinds of resources. Currently, National Park Service officers from Bandelier National Monument, as part of an agreement with the National Nuclear Security Administration, Department of Energy, Los Alamos Site Office, patrol an area including TA-70 and -71. This monitoring should continue in the future as it benefits all parties and limits the amount of damage that can occur in this area. In addition, the Trails Assessment Working Group, with a great deal of help from Craig Martin of Los Alamos County, the State Historic Preservation Office, and other groups at LANL has developed a management plan for organized trails maintenance, which began in 2006 and continues today. This effort is beneficial to all participants, as it creates an atmosphere for open communication, education, and participation; investing in the community.

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