



UNIVERSITY
PENNSYLVANIA
LIBRARIES



CULTURAL LANDSCAPE
PRESERVATION ISSUES-
TSANKAWI MESA,
BANDELIER NATIONAL MONUMENT

Shaun Provencher

A THESIS

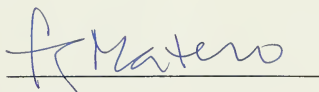
In

HISTORIC PRESERVATION

Presented to the Faculties of the University of Pennsylvania in
Partial Fulfillment of the Requirements for the Degree of

MASTER OF SCIENCE

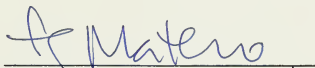
1998



Supervisor
Frank Matero



Reader
Robert Preucel
Associate Professor of Anthropology



Graduate Group Chair
Frank Matero

UNIVERSITY
of
PENNSYLVANIA
LIBRARIES



Acknowledgements

I would like to thank Frank Matero, Robert Preucel, and Jake Barrow without whose support this thesis and its preceding report would never have been accomplished. Further, I would like to thank the staff of Bandelier National Monument, particularly Craig Allen, Kay Beeley, Brian Jacobs, Elizabeth Mozillo, Gary Roybal, Charisse Sydoriak, Supt. Roy Weaver, as well as Jim Trott and Jill Cowley of the Southwest Regional Office and Tom Garrison of LANL whose help with official, cultural, and cartographic information added much to this thesis.



TABLE OF CONTENTS

1.0 Introduction	1
2.0 Chapter 1- Site Identification	3
2.1 Problem Focus	4
2.1.1 Tsankawi Pueblo	8
2.1.2 Cavates	8
2.1.3 Trails	8
2.1.4 Directional Shrines	9
2.1.5 Petroglyphs	9
2.2 Archaeology	10
2.3 Cultural Landscape	14
2.4 Ethnogeography	17
2.5 Methodology	23
2.5.1 Archival Research	23
2.5.2 Site Documentation	23
2.5.3 Ethnography/Traditional Use Study	24
3.0 Chapter 2- Description and Condition Assessment	25
3.1 Geology	25
3.2 Climate	27
3.3 Vegetation	27
3.4 Trails	29
3.5 Mesa Top Pueblo	42
3.6 Cavates	44
4.0 Chapter 3-Evaluation	49
4.1 Determining Priorities: Identification and Solutions	50
4.2 Management Issues	52
4.2.1 Relaxed Management	52
4.2.2 Official Presence	53
4.2.3 Signage	54
4.3 Trail Preservation	55
4.4 Recommendations	56
4.4.1 Management	57
4.4.2 Official Presence	58
4.4.3 Signage	59
4.4.4 Vegetation	60
4.4.5 Trails	61



5.0 Bibliography	71
6.0 Appendices	77
6.1 Photographic Comparisons	78
6.2 Tsankawi Mesa Features Map	86
6.3 Representative Cavate Survey	86
6.4 Access® Resources Database Report	97
7.0 Index	137



List of Illustrations

Figure 1: Tsankawi Unit Area.	3
Figure 2: Hewett ground plan, 1906	10
Figure 3: Mound C, Hewett's field notes, 1905	11
Figure 4: Pueblo and surrounding plan, Hewett's filed notes, 1905	11
Figure 5: H.P. Mera Tsankawi field survey, 1935	12
Figure 6: Lister, Tsankawi field survey, 1935	13
Figure 7: One of many runoff gullies along the paved entrance trail, 1997	30
Figure 8: Red tuff entry point with significant erosion at the trailhead	32
Figure 9: Loop trail divergence, 1997	33
Figure 10: Severe trail wear resulting in projecting tuff fins, 1997	34
Figure 11: Petroglyph panel at Marker #6, 1997	36
Figure 12: Severe crevice erosion between Markers #6 and 7, 1997	37
Figure 13: Visitor collected potsherds, 1997	39
Figure 14: Broken tuff fin (a) and abrasion (b) between Markers # 14 and 15 above ladder, 1997	39
Figure 15: Secondary volunteer trail beyond Marker # 15, 1997	40
Figure 16: Severely worn south side trail, 1997	40
Figure 17: South side trail rut over three feet deep with adjacent surface scouring, 1997	41
Figure 18: Mesa top pueblo ruin, 1997	42
Figure 19: Cavate interior with niches, dado and petroglyphs, 1997	46
Figure 20: Eroded interior cavate entry	47
Figure 21: Fallen cavate ceiling, 1997	47
Figure 22: Visitor deterioration mechanisms	51
Figure 23: Suggested signage consideration areas	59
Figure 24: Suggested trail coercion areas	62
Figure 25: Specific trail movements within the pueblo ruin	63
Figure 26: General trail movement areas	64
Figure 27: Schematic deterioration of tuff trail profile	65



1.0 Introduction

The rise of cultural resource management (CRM) over the last 25 years has occurred in conjunction with a new, interdisciplinary approach to archaeological and historic site management. Ethnography, ecology, cosmology, and spatial analysis are a few of the specializations that have contributed to the broader definition, management, and preservation of cultural sites and landscapes. Contemporary conservation principals and strategies such as defined by the Burra Charter (Australia ICCOMOS) and the Cultural Resources Management Guideline (USDI) have successfully attempted to unite the principles and practices of preservation, and the management of places cultural and historical significance recognizing the exclusivity of time, place, and cultural context.

Both of these documents, the former serving Australia and the latter serving the United States, exist as official and public sector guidelines for the new care and management of cultural heritage. Strong preliminary documentation is stressed along with the establishment of significance followed by physically and culturally appropriate conservation practices. They define both the concepts and guidelines through which cultural resources are researched, documented, preserved, and managed, and pay specific attention to their spatial, temporal and cultural contexts.

This methodological approach insures the complete understanding of the resource, both in concept and planning, as something conversely physical and intangible. NPS-28 states:



A cultural resource consists of a number of physical, chemical, or biological features; at the same time, it consists of ideas, events, and relationships.¹

The dual nature of cultural resources, an inseparable union of social and physical qualities, leads directly to the three central issues of their management: first, to discover the significance or meaning of each resource; second, to slow the rate at which their essential material qualities are lost; and third, to support the use and enjoyment of cultural resources while minimizing negative effects on them. These imperatives are at the heart of the cultural resource program.²

Of particular importance is the concept of cultural landscape and the preservation of traditional cultural patterns and places; concepts which by necessity, address a broad based study of protecting the legacy of man's interaction and impressions on the land than was previously considered. The Tsankawi Unit of Bandelier National Monument affords an excellent opportunity to consider major preservation and management issues for the Tewa people and the official steward, the National Park Service. The history and present issues of use, interpretation, management, and degradation of Tsankawi Mesa make the unit an ideal location for the integration of cultural landscape preservation issues. The following study is an attempt to merge the integrative nature of the Burra Charter with the policy based guidelines of NPS-28 to identify preservation issues and possible solutions under the rubric of National Park Service policy and method.

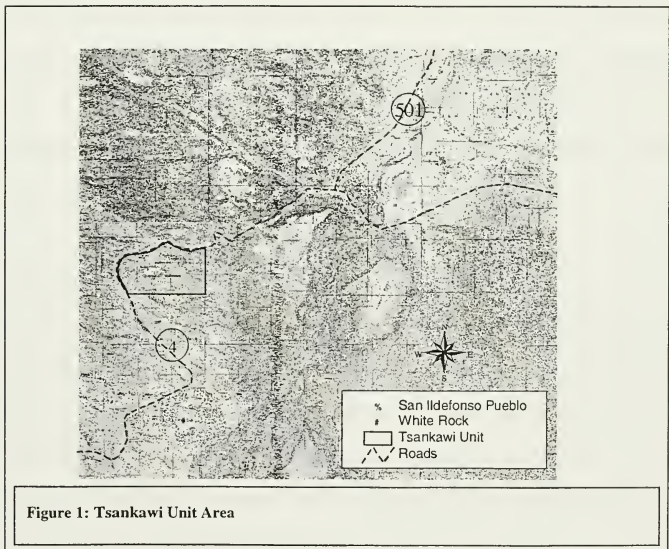
¹ USDI, *Cultural Resource Management Guideline*, NPS-28. Washington, D.C.: National Park Service, 1994, p.9.

² Ibid, p. 11.



2.0 SITE IDENTIFICATION

The Tsankawi Unit of Bandelier National Monument is a detached parcel of land located twelve miles to the north of the Monument's main area in Frijoles Canyon (See Figure 1). The 828 acre unit is bordered on the north and west by Department of Energy (Los Alamos National Laboratory) property and on the south and east by San Ildefonso Pueblo tribal lands. The unit, predominantly a small mesa, rises 6,600 feet above sea level along State Route 4, eight miles northeast of the town of White Rock.



The unit is filled with scattered cultural sites predominantly of prehistoric puebloan origin, but focuses on Tsankawi Mesa proper. The mesa is defined by Sandia



Canyon on the south and Los Alamos Canyon on the north and encompasses a complex series of prehistoric trails worn in the volcanic tuff, an unexcavated pueblo ruin on the top, cavates located primarily but not exclusively on the south slope, and a number of petroglyph panels along the trails. Besides the mesa, the unit also contains other non-native sites including North Mesa and Duchess Castle.

The name “Tsankawi” (*saekewikwaje onwikege*.-for the remainder of this report, all words in Tewa will be italicized) is Tewa in origin and translates as “pueblo ruin of the gap of the sharp round cactus” or “pueblo ruin above the gap of the sharp round cactus.” The name first appeared in print Adolph Bandelier’s journal entry of July, 1885.³ The orthography of the word has changed significantly, however, with older versions being *Sankawi*, *Sankewi*, *Saekewi*, and *Saekewi’i*. Contemporary, spellings include *Tsankawi* and *Tsankawi’i*.

2.1 Problem Focus

Tsankawi is an excellent example of an active cultural landscape. Human use, dating from the thirteenth century to the present has continually defined and shaped the site, resulting in different needs and interpretations for contemporary pueblo people, the National Park Service, and the visiting public. Each of these groups has a unique relationship with the site, whether it be deep rooted in cultural and historical identity, or related to a site visit. These relationships effect Tsankawi in different ways. The effects

³ Bandelier, Adolph F., *The Southwestern Journals of Adolph F. Bandelier*, ed. Charles H. Lange, Carroll L. Riley, and Elizabeth M. Lange. Albuquerque: University of New Mexico Press, 1975, p.58.



are complex, impacting the natural environment, as well as prehistoric and contemporary native and non-native activities, and National Park Service management.

Units such as Tsankawi which incorporate natural and archaeological resources, while at the same time serving as places of traditional use and meaning for culturally affiliated native peoples, present new opportunities for exploring and redefining relationships between different interest groups in the context of developing a sustainable site management program. Their proper conservation and management as protected resources, recreational areas, and living cultural landscapes require a rethinking of the dichotomies often explicit in current resource management policies based on natural versus cultural definition, recreational versus sacred status, and preservation versus traditional use.

The current *Resources Management Plan* (1995) (RMP) for Bandelier is a large and thorough document, however there is a noticeable absence of initiatives directed specifically towards Tsankawi. The unit exists in the RMP predominately as line items despite the plan's listing of "Human use/visitation above resource carrying capacity" as one of the "Most Critical Resource Management Challenges,"⁴ a concept strongly applicable to Tsankawi.

This study proposes instead to focus on the Tsankawi Unit as a cultural landscape and develop integrated preservation suggestions which are culturally, technically, and environmentally appropriate to the physical problems of deterioration, conservation, and

⁴ Bandelier National Monument, *Resources Management Plan: Bandelier National Monument*. Los Alamos, NM: 1995, p. 7.



maintenance of existing cultural and natural resources. It has evolved concurrently with a preservation study being prepared by the Architectural Conservation Laboratory of the University of Pennsylvania's Historic Preservation Department for Tsankawi Mesa. Most information in this report will be included in the final report for the National Park Service.

The Cultural Landscape Approach

According to NPS-28: *Cultural Resource Management Guideline* (Release #4), a cultural landscape is defined as:

... a reflection of human adaptation and use of natural resources and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built.⁵

A cultural landscape is the physical result of human interaction with the natural world.

Tsankawi Mesa, whose prehistoric and contemporary uses have profoundly imprinted the land, displays the essence of a cultural landscape. From the cavates, through the prehistoric trail's use related erosion, to the mesa's place in the cosmological landscape of the Tewa world, Tsankawi affirms itself as a place whose meaning can only be fully understood within the broad framework of a cultural landscape. As defined by the National Park Service, this framework can be characterized by twelve place-defining aspects according to the Cultural Landscape Inventory classification system:

⁵ USDI, *Cultural Resource Management Guideline*, NPS-28. Washington, D.C.: National Park Service, 1994, p. 93.



1. Natural systems
2. Boundaries
3. Views/Vistas
4. Spatial organization
5. Structures
6. Landscape features
7. Circulation
8. Vegetation
9. Archaeology
10. Ethnography
11. Land use
12. Wildlife/Habitat

At present, the aspects most critical to the current study include: structures, landscape features, circulation, vegetation, archaeology, and ethnography. These features are of particular concern due to their significant place-defining elements according to both the National Park Service public management policies and the views of pueblo cultural affiliates, particularly those of San Ildefonso.

The major focus of the current Preservation Plan revolves around five primary features of the cultural landscape and their associated problems:

- the mesa-top pueblo site and its structural and artifact remains



- the cavates and their associated plaster finishes and artifacts
- the rock trails
- the mesa top areas where Tewa shrines would have existed
- the petroglyphs

2.1.1 Tsankawi Pueblo (LA 211)

Located on the mesa top, the most serious problems affecting the unexcavated pueblo include structural erosion, exposure, and collapse from established and volunteer trails, masonry decay, and obfuscation from invasive vegetation, and overall site disturbance and damage from animal activity and artifact/pot hunting (see Appendix 6.2).

2.1.2 Cavates (LA 50976)

Found in clusters at the west tip of the mesa and along the southern and southeastern rims, the most serious problems affecting these unique structures include erosion and collapse of the cavate groupings from forced ingress; animal activity damage and intentional vandalism to the masonry, plasters, and petroglyphs; graffiti from historic and contemporary visitors; and natural agents of deterioration such as water infiltration and efflorescence, both functions of hydrology, topography, and geology (see Appendix 6.2).

2.1.3 Trails

Found throughout the mesa, the most serious problems affecting the extensive system of original rock trails are erosion and enlargement of the trail beds from mechanical abrasion primarily by human agency (visitors) and secondarily by the silting in and vegetation of disused trails. It should be noted that the original creation of the trails and



their subsequent modification and deepening from recent visitor use results in continual changes in the pattern and quantity of water flow over the terrain. This in turn affects the overall erosion of the mesa as well as the growth pattern of potentially destructive vegetation and microflora (see Appendix 6.2).

2.1.4 Directional Shrines

Shrine locations are not known, but planning around probable locations is imperative to complete site management. The most serious problems affecting the probable locations of Tewa directional shrines are the general foot traffic around the pueblo ruin and along the mesa edge, the possible looting of these sites by artifact hunters, and the possible use of the shrines by non-Native religious practitioners.⁶ As well, there could also be other types of shrines or sacred areas within site boundaries.

2.1.5 Petroglyphs

Petroglyphs are located within cavates, and along nearly the entire south and southeast rim with particularly strong clusters adjacent to cavates. While serious problems concerning the petroglyphs are not historically extant, recent vandalism suggests a particular urgency to this concern. (see Appendix 6.2)⁷

⁶ On two occasions the author has found non-traditional votive "offerings" on the mesa.

⁷ On April 10/11, 1998 two flute player figures were drawn on boulders along the south trail along with the carving of a cross into another bolder.



2.2 Archaeology

Despite having never visited Tsankawi, Adolph Bandelier is credited with the first historic mention of the mesa in his 1885 journals.⁸ Four years later in 1899, while working in the southwest for the Smithsonian Institution, Edgar Lee Hewett sketched a ground plan and wrote an above ground description of the mesa top pueblo which was included in his 1904 article *Archaeology of the Pajarito Park, New Mexico* (see Figure 2). He describes the pueblo as a "sky city" with "ten kivas...a large number for the population, which probably never exceeded 300 to 400 people...The ground plan of Tsankawi pueblo embraces about 200 rooms."⁹ However, Hewett did not conduct any excavations on this trip.¹⁰

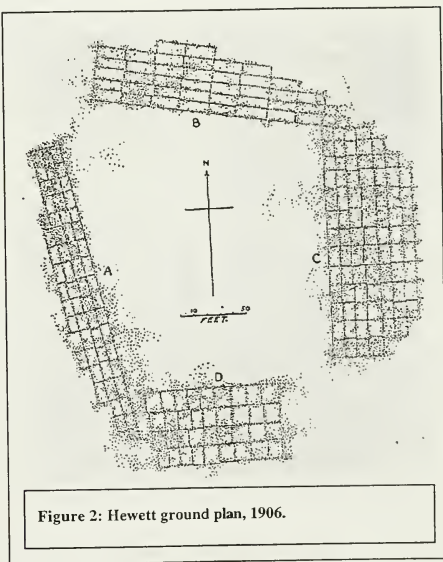


Figure 2: Hewett ground plan, 1906.

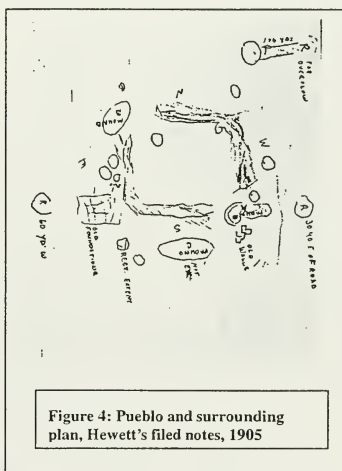
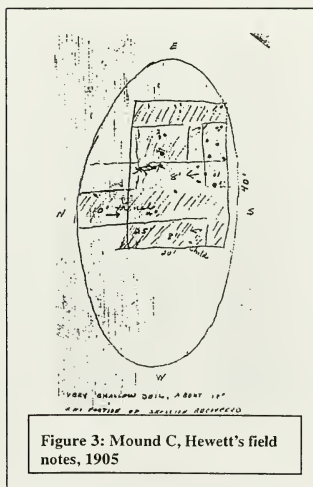
⁸ Adolph F. Bandelier, *The Southwestern Journals of Adolph F. Bandelier*, ed. Charles H. Lange, Carroll L. Riley, and Elizabeth M. Lange, Albuquerque: University of New Mexico Press, 1975, 58, 107.

⁹ Edgar Lee Hewett, *Archaeology of the Pajarito Park, New Mexico*, "American Anthropologist" 6 (1904): 644-645.

¹⁰ An LA 211 {Tsankawi Ruin} site file states "Appendix B. in Hewett (1906:55) indicates that the main cemetery, one kiva, 14 rooms, and a burial crypt in the south face of the mesa were excavated prior to 1900. Photos, maps, notes, etc. were made." This file has not been mentioned elsewhere and so far is unchecked.



In 1905 Hewett returned to Tsankawi to unearth human remains for the Smithsonian Institution. He excavated trenches in two mounds, though exactly which two is unclear. Mound C, to the south of the pueblo (see Figure 3), was definitely excavated according to his 1905 field notes (see Figure 4).¹¹ In his 1938 book *The Pajarito Plateau and its Ancient People* he notes "cemeteries lie just outside the court at the open corners"¹² which would mark the excavated mounds as those in the southeast (Mound A) and northwest (Mound B). Uncovered were twenty-nine human remains and grave artifacts which were shipped to the Smithsonian.



¹¹ Edgar Lee Hewett, Field Notes Transcription (F.W. Mathien), *Santa Fe, Otowi, Chama Valley, Expedition for Smithsonian Institution*, LAJARMs, 1905.

¹² Edgar Lee Hewett, *The Pajarito Plateau and its Ancient People* (Albuquerque: University of New Mexico Press, 1938), 133.



The next evidence for archaeological work on Tsankawi is the H.P. Mera survey of 1935.¹³ Mera surveyed Biscuit Ware sites in northern New Mexico for the Laboratory of Anthropology in the early 1930's to determine their geographical extent, the physical setting of the sites, and the occupational histories. With his map rises the first of a number of confusions concerning the pueblo and its surrounding attributes. He has omitted a number of kivas, mounds, and reservoirs included in Hewett's notes despite more accurate measurements and the inclusion of an exterior room block (see Figure 5).¹⁴

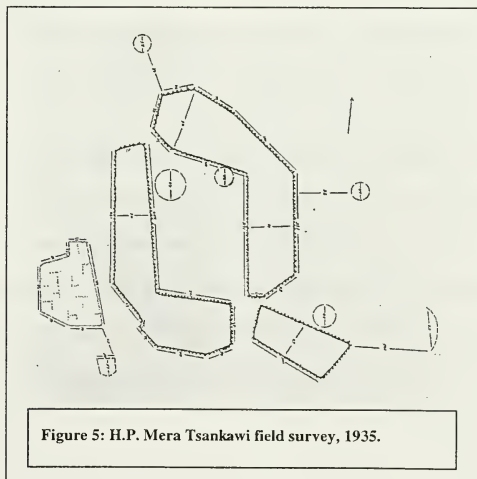


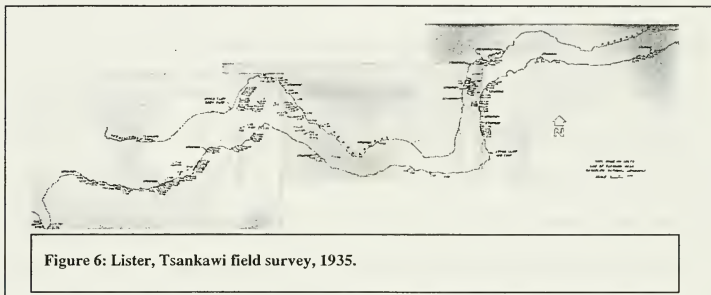
Figure 5: H.P. Mera Tsankawi field survey, 1935.

¹³ H.P. Mera, c. 1935) Field Survey, Tsankawi, Sheetmap 777/20 (ARMS).

¹⁴ The LA211 [Tsankawi Pueblo] file mentions a 1934 publication by Reiter describing 40' square test pits in the northwest and southeast trash mounds. As mentioned above, this file and reference are unchecked.



Later Robert H. Lister worked at Tsankawi in 1939 mapping and stabilizing cavates in the east facing rincon group. His efforts resulted in a map of cavate locations combined with numerical identifiers (see Figure 6).



The above map provided a preliminary identification system for Wolcott Toll's intensive cavate study from 1986-1995. This report strove to serve "two main purposes: adding to archaeological knowledge of these features and assessing their current condition as a means of caring for them."¹⁵ Toll's report also states that "In 1960 C. Johnson, a graduate student at the University of New Mexico, removed a secondary burial of a child from Cave Room C54 Tsankawi Ruin."¹⁶

¹⁵ Wolcott H. Toll, with contributions by Peter J. McKenna and June Crowder, *An Analysis of Variability and Condition of Cavate Structures in Bandelier National Monument*. Santa Fe, NM: Intermountain Cultural Resources Center Professional Paper No. 53, 1995, p. 2.

¹⁶ Toll, 1995, p. 11.



The final reference to archaeological work on Tsankawi is Robert Power's recent Bandelier Archaeological Survey which produced a detailed map of the pueblo ruin area with features not identified before.¹⁷

2.3 The Cultural Landscape

The primary agents responsible for the formation of the landscape on and around Tsankawi are the National Park Service and more directly, the early puebloans who utilized the area during its prehistoric occupation. Today, their descendants, the Tewa-speaking pueblos, continue to visit the mesa as a sacred and ancestral place. It is the Tewa speaking San Ildefonso Pueblo that claims ancestry, through a strong oral history, to Tsankawi today. Paraphrasing Edgar Lee Hewett, Florence H. Ellis wrote in 1967:

According to the traditions of San Ildefonso (Powhoge), the inhabitants of Sankawi were Tewa and related to those of Otowi. Some say the people of Otowi migrated to the Galisteo Basin below Santa Fe, where the Spaniards found the Southern Tewa, otherwise known as Towá. But most report that the people of Sankawi merged with people from Perage and, later, Pohwoge, the San Ildefonso community.¹⁸

As San Ildefonso Pueblo is recognized as having the closest ties and strongest ancestral claims to Tsankawi, it will be used for the rest of this study as the representative Tewa group. Although a case may be made for the inclusion of historic Hispanic and Anglo homesteaders into the cultural landscape equation due to the effects of their

¹⁷ Robert P. Powers, and Janet D. Orcutt (ed.), in press, *The Bandelier Archaeological Survey*. Contribution No. 9 of the Bandelier Archaeological Survey. National Park Service, Santa Fe.

¹⁸ Florence H. Ellis. *San Ildefonso and the Prehistoric San Ildefonsoans*. Report to USDI Bureau of Indian Affairs, Washington, D.C., 1967a, p. 5.



grazing practices surrounding Tsankawi, they will be excluded here but should be considered in a coherent cultural landscape plan.

The physical impact a group has upon the land begins with perception. How a group views a place, be it utilitarian, social, sacred, or cosmological depends on what lenses are used to view the land. The resulting impacts are indicative of world view and attitudes towards interpretation and intervention.

Tsankawi is perceived differently by the two groups most involved in its interpretation and use, the National Park Service and San Ildefonso Pueblo. Not only is Tsankawi a National Park Service site subject to the management policies and strategies required by federal law, but it is also an ancestral site sacred to the Tewa speaking pueblos and to San Ildefonso in particular.

For the National Park Service, Tsankawi is a place of discrete spatial and cultural scope. Its fullest extent within the monument is the outline of the unit, an area of 828 acres. More importantly, the Park Service's management and interpretation of the area is focused almost exclusively on the mesa itself and the remains of the prehistoric village found there. On the mesa, space is defined according to easily understood and managed units: the trails, the mesa top, the pueblo ruin, the cavates, the petroglyphs, etc. This differentiation of space along management lines has direct influence on how the monument, the National Park Service management, and public perceive and use the mesa.

Under this framework, Tsankawi exists as defined units of space and features existing adjacent and separate from each other. This view is helpful in interpreting a site



and is functionally suited to the management of space. However, it does not incorporate the Tewa notions of space under which the pueblo may have in part been built and through which it is understood and accessed today by the descendants of those who built it. Bandelier National Monument's "Park Mission Statement" (1995) requires the NPS:

To provide the means for staff and the public to preserve, protect, understand and enjoy the cultural and natural resources of Bandelier National Monument through an integrated program where management activities support naturally-functioning ecosystems consistent with cultural resource preservation needs.¹⁹

This mission is in accordance with the Antiquities Act of 1906 and the National Park Service Act of 1916, which created and directs the National Park Service "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."²⁰ Further, the mission statement recognizes the need to integrate total management through a natural and cultural framework-an interrelationship necessary for recognizing the cultural landscape of Tsankawi.

The current management policy, however, is not focused on the cultural landscape, but on basic management policy. This includes unsupervised access and relative freedom to interpret Tsankawi mesa in accordance with the present interpretive theory of "discover" and "wildness". This policy in part determines management as

¹⁹ USDI, Bandelier National Monument, *Resources Management Plan: Bandelier National Monument*. Ms on file, Bandelier National Monument, 1995, p. 5.

²⁰ U.S. Public Law 64-235, 39 Stat. 535, National Park Service Act.



either "frontcountry" or "backcountry". Tsankawi is defined as a "frontcountry" site in accordance with its location and visitation and against its "backcountry" attributes of relaxed management, low interpretation, and relative visitor freedom. Yet its cultural attributes do not enter the management vocabulary. Tsankawi is viewed as a "site" and a "resource," terms of loaded meaning. In management and archaeological parlance, a "site" is finite and past, and a "resource" whether cultural or natural, is something tangible to be defined, used, protected and interpreted for the public.

The San Ildefonso people, conversely, view Tsankawi Mesa as living heritage and sacred place. It is a whole, and connected by physical, historical, temporal, and cosmological landscapes, elements and meanings. The mesa top pueblo village, cavates, potsherds, petroglyphs, and surrounding area retain, in whole, the activities and souls of those who created them and continue as living entities forever after their creation. It is the land, the vegetation, the whole biosphere which forms the all-inclusive basis of traditional Pueblo belief and worldview.

2.3 Ethnogeography

Tewa space is defined, not by the dictates of function coupled with management, but by cosmology tied to the land. The latter two overlap and are concentrically repeated in expanding tetrads of built environment, utilitarian space, sacred space, and cosmological layout. This gestalt is extremely complex, with different pueblos revering different places in relation to themselves, and is most clearly explained in Alfonso Ortiz' *The*



Tewa World (1969).²¹ Ortiz' information is based on the beliefs of San Juan Pueblo, not San Ildefonso, therefore referencing this work serves only to explicate Tewa world view for non-natives. Furthermore, the cosmology of the prehistoric Tsankawi Tewa is not necessarily that of the contemporary San Ildefonso. However, for lack of information on San Ildefonso sacred sites, Ortiz will be used as a general model. For clarity, only the physical manifestations will be described here.

According to Ortiz, the outermost tetrad consists of the four sacred mountains that define the furthest extent of the Tewa world. Using ethnographic attributes of San Juan Pueblo as representative of all pueblos, Ortiz names peaks different than Harrington in his *Ethnogeography of the Tewa Indians*. Despite Harrington's claim that "The cardinal mountains are the same for San Juan, Santa Clara, and San Ildefonso," their lists are decidedly different.²² Harrington gives the north mountain as *Kepins* [San Antonio Peak], the west as *Tsikumiupins* [Santa Clara Peak], the south as *Okupins* [Sandia Mountain], and the east as *Agatfaenupins* [Lake Peak]; while Ortiz lists the north as *Tse Shu Pin* [Conjilon Peak], the west as *Tsikomo* [same], the south as *Oku Pin* [Sandia Crest], and the east as *Ku Sehn Pin* [Truchas Peak].²³ These discrepancies suggest that the authors may have been misinformed, that the cosmological beliefs may have shifted with time or due to the influx of people from other pueblos who brought their own

²¹ It is recognized here that Ortiz is a controversial figure among the Tewa. The citation of his work here is important to illustrate the existence of an overlying cosmological landscape which must be acknowledged and incorporated into any future management and preservation policies in the National Park Service.

²² John P. Harrington, *Ethnogeography of the Tewa Indians*, *Bureau of American Ethnology 29th Annual Report*, Smithsonian Institution, Washington, D.C., p. 44. This may be due to J.P. Harrington's use of E.L. Hewett's San Ildefonso informants.

²³ Alfonso Ortiz, *The Tewa World: Space, Time, Being, and Becoming in a Pueblo Society*, University of Chicago Press, Chicago, p. 14.



cosmological constructs, or a significant difference may exist between San Juan and San Ildefonso sacred mountains. Whichever mountains may be the present sacred sites, they contain shrines visited only by the "Made People," the highest level of Tewa society, on spiritual pilgrimages.

The next interior tetrad is the sacred *Tsin*, or flat topped hills, located within a few miles of the pueblo and generally containing a sub-tetrad of sacred pools, or *pokwi*. These are the places where certain Tewa deities live. The *pokwi* and *Tsin* for Tsankawi are not known, and location of the pools may have changed with climatic fluctuations making their identification difficult. However, around Tsankawi, are a number of mesas that could be sacred areas due to their proximity, visibility, and relative flatness of their tops, hallmarks of *Tsin*. Possible mesas may include Buckman mesa to the east, a likely southern *Tsin* of San Ildefonso Pueblo, and the Mesita de los Alamos to the northwest. As well, other sacred sites near Tsankawi where ancestors, as opposed to deities, live would be the pueblo ruins in the surrounding landscape. These include Otowi to the north, Perage to the northeast, Navawi and Tsirege to the south, and Puye to the northwest.

Between Tsankawi and the *Tsin* were located the agricultural fields in the canyons surrounding Tsankawi. Los Alamos Canyon to the north and Sandia Canyon to the south both contain intermittent streams that merge at the confluence of the canyons about one mile to the southeast. This layout provides a strong water source for Tsankawi and would have provided enough water for the village's fields. In addition, agricultural field houses would have been located within these agricultural areas, thus seasonally spreading the



domestic extent of the village. Other, smaller villages located in canyons and on mesas around Tsankawi, North Mesa for example, contributed to the agricultural labor. These smaller settlements could be considered a part of Tsankawi village due to their proximity and assumed sharing of natural resources. As well, Tewa pueblos further away such as Otowi, Navawi, Perage, and Tsirege would expand the social and economic spheres of the village through trade, religious, and marriage interactions.

Next, located immediately outside of the pueblo are the principle shrines of the directions constructed of circles or piles of stones. Names of these shrines for San Ildefonso could not be found, but for San Juan they are as follows: To the north is *Than Powa*, “Sun-water-wind”, to the west is *Awe Kwiyo*, “Spider Woman”, to the south is *Nu Enu*, “Ash Youth”, and to the east is *Ti Tan He I*, “Large Marked Shield.” “...these four are the principal ones [shrines] of the directions, in the sense that regular, patterned usages and meanings attach to these, and not to the others. Collectively these are known as the *Xayeh T’a Pingeh*, “Souls-dwelling Middle-places.”²⁴ These locations, most likely located on the pueblo level of Tsankawi, are shrines to the souls of the dead, including the souls of man-associated objects associated with the sacred past. These shrines may be the sacred places on the mesa still in use today by the San Ildefonso Pueblo.

The smallest tetrad is the *bu pingeh*, “dance plazas,” inside the pueblo with their four sides and four primary directions of dance. Within the plaza itself is the *Nan echu kwi nan sipu pingeh* or “Earth mother earth navel middle place,” a shrine made of a circle or pile of stones. “This is the sacred center of the village...The mountain earth navels



gather in blessings from all around and direct them inward toward the village; the mother earth navel is the source of all these blessings, so they are directed outward in all directions. By the system of ideas at work here, everything good and desirable stays within the Tewa world.”²⁵

With such a format for differentiating space, not only do the Tewa understand and define place, but they attribute the cosmos within the same physical construct. Moving throughout the landscape, whether it is inside the plaza of the pueblo or to a distant sacred mountain, has a direct correlation to movement through creation and among the spirits and souls of their ancestors.

The landscape surrounding Tsankawi is cut and defined by the canyons and mesas of the Pajarito Plateau. It was prehistoric life, so highly interactive with the natural environment that infused the landscape with utility and meaning. Hunting, gathering, and plant domestication took place predominantly among the canyons and around the mesa, the top of the mesa being ill suited for crops. Domestic life transpired on and around the mesa, as evidenced by the potsherd and lithic scatters on the mesa top and sides; and religious life pervaded throughout, as can still be seen in the petroglyphs and with contemporary Tewa pueblos.

The trails, so clearly evident at Tsankawi, do not end at the unit's parking lot, but continue down into the canyons linking the village with its fields, field houses, other pueblos, shrines, and water sources. These places were all named with meanings specific to and descriptive of place and contributed essentially to life upon the mesa. The closest

²⁴ Ortiz, p. 20.



water source was north in Los Alamos Canyon; and neighboring pueblos existed on North Mesa and in Los Alamos Canyon, both within three quarters of a mile and linked by trails some of which are barely still visible today.

Tsankawi is not and never was contained. It had an interactive relationship with the landscape during occupation, and it still does today for San Ildefonsoans. The incredible views once witnessed by the puebloans still exist atop the mesa, the trails used to move throughout the land are still extant, vegetation traditionally used by the Tewa still grows there, and the history inextricably linked to cosmology still pervades the Tewa world. Today, the spatial and management definitions imposed upon the site by the National Park Service add another layer to the cultural landscape. New boundaries have been drawn representing new definitions of space, place and use based on ownership, protection and modern stewardship. Tsankawi is a living place, still active in different ways through the contemporary San Ildefonso Pueblo, the National Park Service, and the visitors whose perceptions persist today in successive and interactive overlays of use, history, cosmology, management, materiality, and imagination.

²⁵ Ortiz, p. 21-22.



2.5 Methodolgy

2.5.1 Archival Research

The majority of archival information was found in the library and archives of Bandelier National Monument, the Laboratory of Anthropology (ARMS) and the Photo Archives at the Museum of New Mexico, and the Southwest Regional Support Office of the National Park Service. Official reports on the administrative, cultural, archaeological, ecological, and managerial aspects of the unit were studied and compared along with earlier archaeological surveys such as Hewett's field notebooks, various related ethnographies, archaeological reports, secondary sources, and interviews. Historic and contemporary site images including aerial photographs were used to determine the origins of resource attributes and their alteration through time. Maps dating from the turn of the century through the present day were used to determine the physical, cultural, and political changes on Tsankawi and the surrounding area. However, it must be remembered that these maps represent the perceptions of the mapmakers as to what they felt was important to record at the time, offering unique insights into methodology and focus.

2.5.2 Site Documentation

Repeated visits to Bandelier and more specifically Tsankawi between June 23rd and July 9th, 1997 and April 10th through 13th, 1998 offered the chance to observe and record significant issues and conditions at Tsankawi. Hundreds of photos were taken, the most illustrative of which were then scanned into Adobe Photoshop 4.1 to create a digital

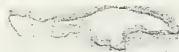


comparative image archive. Trail and site conditions were documented by original mapping, noting on photocopies of historic and contemporary maps, and drawing conditions on acetate overlays covering aerial photographs.

This information was brought into Arcview®, a geographical information system by ESRI, where it was used for map development. More detailed studies of trail conditions were obtained by measuring and photographing specific trail segments and their profiles in order to determine the areas that require immediate care. In addition, a preliminary cavate condition assessment, based on Toll's survey, was performed in order to determine specific deterioration processes for future stabilization work (see Appendix 6.3).

2.5.3 Ethnography/Traditional Use Study

Ethnographic review of the area began with the study of early twentieth century accounts by early ethnographers and archaeologists such as Edgar Lee Hewett, Adolph Bandelier, Jesse Nusbaum, and J.P. Harrington. Information from these sources, particularly those pertaining to the Tewa and San Ildefonso Pueblo, was augmented and compared with more contemporary sources of ethnographic and archaeological data such as Alfonso Ortiz, William Ferguson, Arthur Rohn, Wolcott Toll, Robert Powers, William Dunmire, Gail Tierney, Esther Martinez and others.



3.0 DESCRIPTION AND CONDITON ASSESSMENT

3.1 Geology

Tsankawi is a physically complex site. Its location in a volcanic eruption zone combined with the peculiarities of being located at an elevation of 6600 feet together create an environment largely responsible for the several types of cultural manifestations impressed upon it.

The mesa sits upon the Pajarito Plateau, a 300 square mile bed of volcanic ash running 300 meters deep. Located east of the Jemez Mountains, the plateau's northern border sits at the base of the Sierra de los Valles with the southeast border at the 300M deep White Rock Canyon through which the Rio Grande flows.

The geology of Tsankawi primarily consists of two related but distinct types of volcanic tuff, the Otowi member overlain by the Tshirege. Both ash deposits are the result of eruptions of the Valles Caldera about eleven miles to the west during the Pleistocene period and are collectively referred to as Bandelier Tuff. These layers are defined by Goff *et al.* 1990 as the following:

Upper Bandelier Tuff (Tshirege Member) –White to tan to pink welded rhyolitic ash-flow containing abundant phenocrysts of sanidine and quartz and trace clinopyroxene, hypersthene, and fayalite. Sanidine typically displays a blue iridescence; consists of several flow units in a compound cooling unit; locally contains a thin (.05m) nonwelded laminated ash-fall deposit at base unit (Tsankawi Pumice) that contains roughly 1% hornblend latite pumice (Bailey *et al* 1969); locally may contain abundant rock fragments from nearby volcanic sources; Qbt (map symbol) forms conspicuous pink cliffs throughout the Pajarito Plateau; originated from catastrophic eruptions that formed the Valles Caldera; K-Ar age 1.12+/- 0.03 Ma; maximum observed thickness about 120m.



Lower Bandelier Tuff (Otowí Member)- White to pink, welded rhyolitic ash-flow tuff containing abundant phenocrysts of sanidine and quartz and sparse mafic phenocrystal sanidine may display blue iridescence; consists of several flow units in a compound cooling unit; locally contains a nonwelded laminate to poorly sorted ash-fall deposit at abundant volcanic and Paleozoic rock fragments; Qbo (map symbol) discontinuously fills in rugged topography on a pre-Toledo caldera age volcanic surface; forms thick deposit west of St. Peter's Dome area; very difficult to distinguish from upper Bandelier Tuff in hand samples; best distinguished by poorer degree of welding, more abundant lithic fragments, less abundant iridescent sanidine, and stratigraphic position beneath the Tsankawi pumice; originated from catastrophic eruptions that formed the Toledo caldera; K-Ar age 1.45 ± 0.06 Ma, maximum observed thickness about 150m.²⁶

This rock was subsequently eroded by water flowing from the caldera across the Pajarito Plateau to the Rio Grande forming the many east/west canyons which define the topography of the area. The Otowí tuff, found from the canyon floor to about halfway up the mesa is of reddish color and is the significantly softer of the two. The upper layer, or Tshirege tuff is light grey in color and consists of "a series of cliff-forming welded ash flows."²⁷ Both layers are capped by a hard, flat layer of zeolite-cemented tuff.

These harder beds form the caprock cliff edges at the top of each layer. The red Otowí cap is particularly visible as the south side trail route; the Tshirege cap forms the top of the mesa. Both tuff layers, due to their soft and easily abraded nature, provided early inhabitants with the ability to construct both excavated caves and masonry block pueblos. "The massive, relatively easily excavated, tuff deposits exposed by the canyons

²⁶ Stephen Goff et al. *The Valles/Toledo caldera complex, Jemez volcanic field, New Mexico. Annual Review of Earth and Planetary Sciences*, 1990.

²⁷ R.A. Bailey et al. *Stratigraphic Nomenclature of Volcanic Rocks in the Jemez Mountains, New Mexico*. U.S. Geological Survey Bulletin 1272-P. U.S. Printing Office, Washington, p. 13.



of the plateau made possible the construction of cavate dwellings,²⁸ as well as lightweight stone material for talus pueblos in front of the cavates and the freestanding pueblo on the mesa top.

3.2 Climate

The Pajarito Plateau experiences a semiarid continental climate with varied and unpredictable weather. Spring is defined by strong winds and varied temperatures that often fall below freezing; and brief but violent snowstorms can occur in March and April. Summer temperatures rise above 90° F with violent thunderstorms occurring daily. Sixty percent of Bandelier's annual mean rainfall of 40.7 cm falls between June and September. Fall is sunny with daytime temperatures between 70-80° F, which often fall to freezing at night. Similar temperature variations occur through the winter ranging from 0-60° F, often accompanied by heavy snowfalls.²⁹

3.3 Vegetation

Tsankawi sits in the lower pinon-juniper ecozone, above juniper-grassland and below ponderosa pine. Characterized by one-seed juniper (*Juniperus monosperma*, *huu*) and pinon pine (*Pinus edulis*, *t'oe*), this ecozone rises from 6,000 to 7,000 feet and is the elevation of much of the prehistoric life on the Pajarito Plateau. According to Dunmire and Tierney, "This pinon-juniper plant community...provides a habitat for more species

²⁸ Toll, 1995, p. 15.

²⁹ Brief Climatology for Los Alamos New Mexico, internet, <http://weather.lanl.gov/html/climatology.html>



of edible plants than any other major biological community in the region...and in all New Mexico.³⁰ As well, many plants of historical and contemporary importance to Tewa culture flourish here, some of which are indicator species for archaeological sites.

Pinon pine is found on the slopes and top of Tsankawi. This trademark tree is still held by Tewa Pueblo tradition to be its most ancient food. Juniper is found along the lower trails and holds many strong traditional uses. Besides these dominant trees, the mesa provides habitats for Apache plume (*Fallugia paradoxa*, *t'oe*), bluestem (*Andropogon scoparius*, *taa*), blue trumpets (*Ipomopsis longiflora*), buckwheat (*Eriogonum*, *tata*), four-o'clock (*Mirabilis multiflora*, *puhun*), Indian tea (*Thelesperma*, *depheh*), mountain mahogany (*Cercocarpus montanus*, *whaa*), sagebrush (*Artemisia*, *t'oe*), saltbush (*Atriplex*, *ta?-aayaa*), scorpionweed (*Phacelia*), sumac (*Rhus trilobata*), tansy mustard (*Descurainia*, *p'in whaa*), and yucca (*Yucca baccata*, *phaa*).³¹ Apache plume is common along trails at Tsankawi and has been used by the Tewa for brooms and various medicinal purposes. Blue trumpets are found along the lower Tsankawi trails and have various medicinal purposes as well. Though less common at Tsankawi, Indian tea is well known by pueblos who "consider it to be the best of several wild plant species for making tea"³². Yucca had many economic, dietary, and utilitarian uses that continue today. As well, mountain mahogany had many utilitarian uses, and sagebrush is purely medicinal. Scorpionweed is found outside the cavates of Tsankawi and "appears to be an indicator

³⁰ William W. Dunmire, and Gail D. Tierney, *Wild Plants of the Pueblo Province*. Santa Fe: Museum of New Mexico Press, 1995, p. 10.

³¹ Dunmire and Tierney, 1995, 92-223. Esther Martinez, *Tewa Dictionary*. San Juan Pueblo. 1982, 42-44.

³² Ibid p. 223.



plant for these specialized habitats on the Pajarito Plateau.”³³ Tansy mustard, found on the talus slopes of Tsankawi, is a prehistoric food, pigment, and dye source as well as an indicator plant often growing in heavy soils provided by weathered earthen mortar and plaster.

3.4 The Trails

The manmade trails and structures of Tsankawi are arguably the most prominent anthropogenic feature of the mesa. It is the trails, connecting the pueblo ruin and cavates, which establish the overall circulation pattern through the landscape, undergo the most visitor use, and are therefore consequently most at risk. All three are inextricably tied together along the official route established on the mesa, and consequently the majority of the damage done by visitors is concentrated along this route. This Feature Description and Conditions Assessment will describe Tsankawi’s trails, pueblo ruin, and cavates as they exist today with particular attention to natural and manmade deterioration.

For descriptive purposes, the trail can be easily divided as segments from the entrance parking lot through the twenty trail markers currently found along it (see Appendix 6.2). The parking lot is a loose gravel and dirt lot for thirty cars bounded on the park side by a three foot high post and wire fence with a wire gate leading to the trail. Immediately inside the gate on the north of the deeply sloped asphalt trail is a metal pamphlet container and the official “Bandelier National Monument” sign is further down on the south side. This initial stretch of trail is down grade from the parking lot which

³³ Ibid p. 200.



causes ice sheets to “form and persist even in mild winters.”³⁴ From here is a direct view of the west cliff of the mesa with cavates visible at the base. At this point the trail has a water channeling gully to the south and is in fair to poor condition with cracks every six to eight feet. Vegetation here is mostly grass and juniper with a small clearing bordered by dense pinon and juniper ahead.

Forty feet from the gate is a sandy wash from rainwater runoff traveling over the path into a stone culvert which continues due north into a wash two feet below trail grade. Twenty feet further is the Visitor’s Center, built in 1989 of stabilized adobe and vertical wood sheathing around a trailer that originally sat on the site. The Center is unmanned but has water hookups and a trailer pad behind formerly used by seasonal rangers during the summer and fall. Its covered porch contains two picnic benches and four restrooms in the rear screened by a wooden fence. Visitor information is posted in glass cases facing the trail. Vegetation



Figure 7: One of many runoff gullies along the paved entrance trail, 1997

³⁴ “Bandelier Environmental Management Committee Meeting Minutes, 3/13/97.



immediately surrounding is mostly juniper with little groundcover. General erosion is evident from rain and snow water runoff. Wooden signage marks the trail here and an access road leads southward to the highway.

Beyond the Visitor's Center the asphalt trail gradually slopes upward towards the mesa with a manmade gully on the north side channeling water to a drain near the access road. Sixty feet from the center is a natural rainwater gully diagonally to the south, leading to a stone culvert. Twenty feet beyond, another rainwater gully runs diagonally to the south due to the uneven paved trail (see Figure 7). The north side of the trail has a shallow parallel channel immediately alongside leading down slope to the culvert. A similar stone lined channel diverts water into a gully south of the trail. Further, another channel to the north is fed by an asphalt feeder. Water drainage here comes down from the north slope across the trail into a deep east/west arroyo on the south side. Just before the "outdoor museum" sign, a two-foot deep lateral arroyo slopes from the north, under the trail through a pipe, and into the aforementioned arroyo on the south. The ground is hilly and bare with scattered clumps of grass and sage.

At marker #2, the grade is nearly even with the trail and yet another arroyo runs north/south under the trail into a stone culvert on the south side. The uneven impermeable asphalt surface of the trail channels runoff in a number of places forming southern gullies. At the "hazardous cliffs" sign, the drainage system switches primarily to a stone culvert on the south side of the trail leading to the arroyo at marker #2. Ten feet beyond the last stone culvert, the trail slopes steeply up with a line of rocks edging the trail on the right, protecting it from a steep erosional drop off on the south side. This



segment of the trail, just before the prehistoric trailhead, is heavily impacted by runoff from the mesa cliffs above, and is severely eroded on both sides with little vegetation on the immediate surrounding landscape.

At marker #3, the trail is at its highest point before the prehistoric entrance with rocks from the mesa cliff abutting the trail to the north. The close proximity of the mesa here directs runoff across the trail into arroyos six to eight feet deep on the south. A volunteer trail, formerly marked with a small cairn, leads north off the trail to the west mesa cavates visible from the parking lot. The prehistoric trail begins here with a down sloped entry through the red Otowi tuff with depths or wall heights of over six feet causing a



Figure 8: Red tuff entry point with significant erosion at the trailhead.

serious drainage issue. At the “watch children” sign, the asphalt ends, and a volunteer trail leads southeast to an unofficial perimeter trail around the mesa. Tuff deterioration at this trail entrance is severe and active (see Figure 8 and Photos 5 and 6 in Appendix 6.1). Late nineteenth/early twentieth century modifications of the trail were made, presumably to facilitate visitor entry and control deterioration. Steps, visible in the earliest



photographs, and presumably non- prehistoric in origin (ca. 1930), have now given way to a ramped entrance. Erosion probably due to continued deterioration of the passage from the mechanical abrasion of visitor's hands, boots, and backpacks, as well as from wind and rain and freeze-thaw cycling has contributed to the widening of the path and debris deposition on the ground. At the end of the passage are several hand and foot holds worn into the rock.

The trail rises from the red tuff entrance onto a large caprock ledge that projects southward from the mesa. There is little vegetation on the ledge, though juniper is prevalent on the edges. This area offers the initial view of both the mesa above and the canyon below. On the east edge of this ledge, a volunteer trail leads down into the canyon and links with the aforementioned volunteer trail leading from the previous "watch children" sign. The official trail continues from the northeast corner of this ledge along the red caprock and is discernible largely as a shallow depression with gray discoloration worn by visitors. This discoloration indicates a three to five foot wide range of active foot traffic on and around the prehistoric trail, which is the rule throughout the entire mesa. The trail here is nearly devoid of debris.

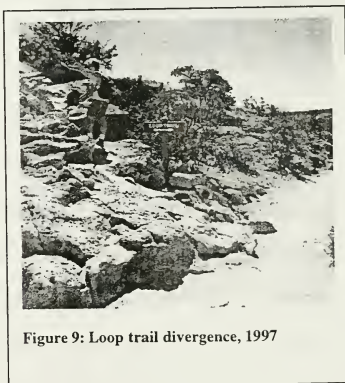


Figure 9: Loop trail divergence, 1997



At this point the “loop trail” sign indicates the trail split and official circulation direction. Here the trail changes nature (see Figure 9). Running up slope to the north, the trail becomes rougher with more deeply incised prehistoric paths, boulders, and switchbacks. The trail here is severely worn with significant foot traffic abrading the surrounding area and deeply channeling the trail itself, often with multiple parallel grooves (see Appendix 2, Photos 13 and 14). Significant rock debris collects in the deep trails, indicating active erosion. This deteriorated condition continues strongly until marker #6.

These parallel path grooves create tuff fins that will inevitably grow thin and break off, creating a wider irregular depression (See Figure 10), thus changing the appearance and durability of the trail, as well as creating a pedestrian hazard. At the west end of the



Figure 10: Severe trail wear resulting in projecting tuff fins, 1997

second switchback near the triple groove, an arrow with a circle around the shaft is incised into the tuff pointing westward, perhaps indicating an abandoned historic route around the mesa. It is at the west bends of the switchbacks that the little used prehistoric trails to the west end of the mesa spur off, particularly before marker #5.

With the number of switchbacks here, inevitable volunteer trails shortcut the angles. However, a management decision has been made to deter these volunteer trails with small boulders placed predominantly on the down slope side of the trail. The large



expanse of gently sloping rock to the southeast is uniform in color and displays no abrasion. It seems here the visitor is compelled to travel in the up slope and northward direction of the trail.

The area between marker #5 and marker #6 is heavily trafficked by visitors due to the petroglyph panels located here. This is a prime photograph location and widespread foot traffic is present. As well, visitors attempt to follow the rock panels off trail to the west, come to the end of these, and slide down the rock slope to the trail below causing heavy abrasion damage in this area.

Excellent evidence of natural trail reclamation is evident about fifty feet after marker #5 where the right spur of a forked trail has been blocked by debris, filled in by wind and rain, and has sponsored the growth of various plants. Apache plume, sage, and other herbaceous species have rooted here further preventing visitor use. This area could provide a good location for the study of vegetation succession along unused and silting trails.



Marker #6, located just before the ladder and crevice route to the mesa top, is the stopping point for visitors to view the first petroglyph panels of Tsankawi. As well, this is probably the most photographed area of the mesa (see Figure 11). These are the first petroglyphs visitors see and are of much interest due to the depictions of masked figures, axe wielding forms, and the



Figure 11: Petroglyph panel at Marker #6, 1997

ubiquitous hump-backed flute player. Across from the panel is a volunteer trail leading behind some boulders to a fine panel not normally visible to the public depicting a katchina-like figure with feather headdress. Immediately to the right of the panels is a deep trail crevice, originally the prehistoric trail to the mesa top, and the Park Service alternative route via a ladder beyond. This crevice is arguably the most deteriorated portion of the prehistoric trail. Historic photographs indicate a ground loss of over four feet of tuff since the turn of the century. The walls have also been severely eroded and the crevice widened by visitor traffic (see Figure 12 and Appendix 6.1, Photos 3 through 8).



On the mesa top, the trail changes significantly. Above the ladder or crevice route is marker #7 signaling the change to a flat, easily traveled trail to the pueblo ruin. Here the trail is not clearly marked aside from a scatter of small rocks on the right, consequently many visitors choose not to follow the trail due east, but move north to the cliff overlook. This is evident from distinct scouring of the rock from foot traffic. Generally, the segment of trail between marker #7 and the pueblo ruin is not followed. Vistas to both the north and south, combined with a walkable surface



Figure 12: Severe crevice erosion between Markers #6 and 7, 1997

and the narrow neck of the mesa, draw visitors off the trail. Vegetation is scattered pinon-juniper, and tuff abrasion is minimal due to the lack of an incline. However, this is an excellent vantage point to the trails on the south side which show the severe abrasions and lighter discoloration from foot traffic.

Moving northeast towards the pueblo, particularly before marker #8, the trail again becomes channeled with abrasions on both sides from visitor avoidance of the existing depressions. Visitors shun the difficult-to-maneuver four to six inch troughs and choose instead to travel on the surrounding caprock. Upon approaching the pueblo on the



most broad part of the mesa top the trail widens to a compacted dirt and debris-filled path.

The terrain of the pueblo clearing is slightly rolling and grassy with individual stands of pinon-juniper. Saltbush, a ruins indicator plant, dominates the groundcover and provides an excellent barrier to foot traffic over the entire ruin area.

The trail route here is intricate (see Appendix 6.2). Officially it runs past marker #10, over the northwest corner of the ruin wall, southeast across the pueblo, and through an opening in the southeast corner. However, the route is complicated by numerous secondary and tertiary volunteer paths which lead throughout the pueblo and mesa top.

The heavily compacted trail runs past marker #10 and the “Tsankawi Ruin” sign, over the ruin walls (where a secondary trail follows the wall perimeter to the southeast corner) exposing the stones and room walls below, and into the ruin plaza where it initially splits into two main trails. To the right is the official trail, and to the left is the secondary trail leading down into a kiva depression where it again splits into a number of tertiary trails that lead to the north cliff and the south eastern extent of the mesa. These trails are complex and often fade out to unintelligible patterns due to the sparse vegetation beyond the ruin. Foot traffic is then dispersed over the entire north and southeast portions. Numerous tertiary cul-de-sac trails spur from primary and secondary trails to ant colony clearings. These colonies bring to the surface large amounts of potsherds common over the ruin area. These numerous artifacts are often picked up and placed by visitors on flat rocks along the trails. There, removed from their archaeological



context, the potsherds are then removed by unsympathetic visitors or artifact collectors. This placement also stimulates others to hunt for them (see Figure 13).

Beyond the southeast corner the trail leads downhill into another kiva depression at marker #13 and continues to the upright slabs of the former reservoir at marker #14 where pinon-juniper stands

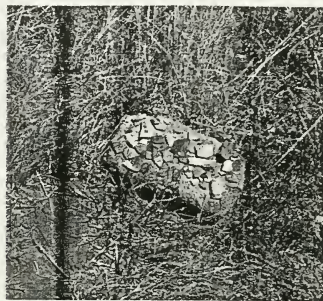


Figure 13: Visitor collected potsherds, 1997

begin again. Beyond these is the southeast mesa cliff edge. A secondary trail leads along the caprock to the northeast tip where it joins the convergence of the secondary and tertiary trails originating in the ruin.

The descent from the mesa top to the primary cavate group of the southeast face is severely worn from the descending abrasion of visitor footsteps. Significant fins between worn depressions, similar to those between markers #4 and #6 (one is in fact broken off, see Figure 14), make the descent difficult and dangerous.

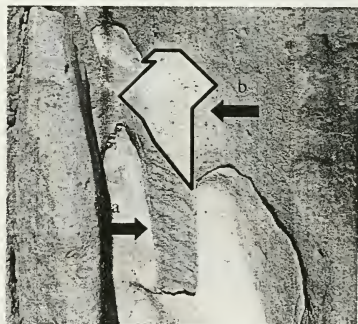


Figure 14: Broken tuff fin (a) and abrasion (b) between Markers # 14 and 15 above ladder, 1997

A ladder completes the descent to the trail below.



channeled with trenches worn over two feet deep and eroded along both sides due to the difficulty of travelling in the ruts (see Figure 16). Rock art panels continue above and a second, heavily visited group of cavates is found in the large rincon facing due south past marker #18. Between marker #18 and this group of cavates is a section of trail known for the periodic unearthing of human remains.

Just beyond marker #19, the trail reaches its maximum trough depth on the south side of over three feet deep with significant associated wear (see Figure 17). The cavates in the red tuff below are easily visible from this section. Beyond marker #19 the trail reaches the Otowi tuff caprock, here broken by a series of geologic joints parallel perpendicular to each other and responsible for the jagged edge loss. The trail continues with little wear back to the junction near marker #4.



Figure 17: South side trail rut over three feet deep with adjacent surface scouring, 1997



3.5 Mesa Top Pueblo

The pueblo atop Tsankawi Mesa (see Figures 2, 3, 4, 5, 18 and Appendix 6.1, Photos 15 and 16) is a predominantly unexcavated ruin (Hewett performed a limited excavation in 1905) with construction dates from the thirteenth to fifteenth centuries; though the most common estimate is

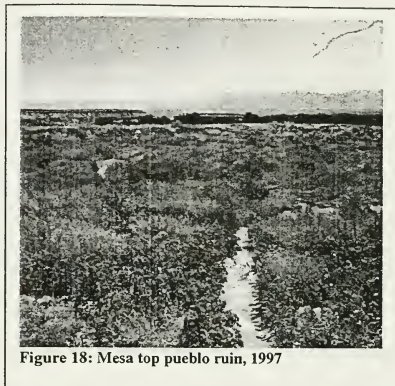


Figure 18: Mesa top pueblo ruin, 1997

to the Rio Grande Classic Period of the 1400's. Tsankawi was probably built as a Late Coalition period aggregate village, condensing the dozens of smaller, lower pueblos in the canyons to the west (Hill and Trierweiler, 1986). Tsankawi village is most likely the result of a combination of warfare, migration, drought, and politics. It has a rectangular plan oriented to the cardinal directions with an estimated 200-300 room blocks surrounding a single large plaza. Openings in the walls are found at the northwest, southwest, and southeast corners.

Within the plaza are two kivas with approximately eight more surrounding the pueblo (see Appendix 6.2). Those inside the plaza show little stone construction due to erosion, fill, vegetation, and the introduction of historic trails. However, the two kivas off the southwest corner of the pueblo (normally out of the public's view) are dug



directly into the tuff, and one has the remains of a small vertical niche, possibly a ventilator, on the south side.

The walls of the pueblo are built of the soft Tsirege tuff that composes the surface of the Pajarito Plateau and the entire structure once may have been as much as eight rooms deep and three stories high. Now collapsed, these walls form little more than a rectangular ridge four or five feet high around the central plaza. Still, some room layouts are discernible particularly on the south side. Construction patterns can be seen on the north side between the two secondary trails that pass over the walls.

Though this area of the mesa has mostly scattered vegetation, a circle that extends approximately one hundred feet around the ruin is particularly overgrown with saltbush as is the plaza (Appendix 6.1, Photos 3 and 4). This archaeological indicator species thrives in deep sandy soils such as the areas around a ruin composed of prehistoric trash heaps, mud mortar and burials. A lone juniper stands at the center of the plaza.

Most likely chosen for its highly defensible location, Tsankawi commands an impressive view. To the south are the Sandia Mountains, to the west are the Jemez Mountains, and to the east are the Sangre de Cristo Mountains. According to most early writers, the site was considered “the most picturesquely situated of any settlement of primitive people... ever seen. It is a veritable ‘sky city’ ” (see Appendix 6.1, Photos 1-4).³⁵

³⁵ Harrington, 1904, p. 644.



3.6 The Cavates

The term “cavate” is the result of dropping the “ex” off the word “excavate” and was originally used by Mindeleff (1896), though it has more recently been defined by Wolcott Toll as “cavities in the canyon wall that are primarily the result of excavation of the rock”.³⁶ These structures are a primary part of the Classic Period Tsankawi village. Covering much of the mesa’s warm south face, they are concentrated in the two major rincons in both tuff layers. As well, a smaller group of cavates is found at the western tip of the mesa. Mindeleff writes:

Cavate lodges comprise a type of structure closely related to cliff houses and cave dwellings. The term is a comparatively new one, and the structures themselves are not widely known. They differ from the cliff houses and cave dwellings principally in the fact that the rooms are hollowed out of cliffs and hills by human agency, being cut out of soft rock, while the former habitations are simple, ordinary structures built for various reasons within a cove or on a bench in the cliffs or within a cave.³⁷

These structures are found throughout the Pajarito Plateau, particularly following the limits of the Bandelier tuff from which they are dug. Archaeological evidence suggests that the Tsankawi cavates were dug during the same period that the pueblo was built above, though few archaeological artifacts have been found in them. A few late glaze ware ceramics also suggest a possible period of late 17th century occupation that would coincide with the Pueblo Revolt of 1680.

³⁶ Toll, 1995, 1.

³⁷ Cosmos Mindeleff, *Aboriginal Remains on Verde Valley, Arizona*. In Thirteenth Annual Report of the Bureau of American Ethnology, by J. W. Powell, p. 179-261. U.S. Government Printing Office, Washington D.C., p. 217.



Many cavates also had “talus puebls” or a series of rooms from one to four stories, built in front of them. However, at Tsankawi these additions never reached above two stories as dictated by the shallow steps of the cliff face and evidenced by the viga holes above the cavates.

Cavates of Bandelier National Monument can be divided into three physical types as defined by Toll: “small, unsmoked rooms used for storage; rooms with smoke blackening and other features that may have been habitations; and the largest cavates, smoke-blackened and containing rock art and sometimes loom anchors, which have been called ‘kivas.’ ”³⁸ However, the Tsankawi cavates, while containing all of these general features, are slightly more complex than those in Frijoles Canyon.

The structures predominantly contain one room and one entrance with a smoke hole through the outside wall. The rooms are generally rectangular in floor plan and trapezoidal in height with perpendicular wall connections and rounded intersections of wall and ceiling. Yet many Tsankawi cavates contain other structural features such as rear room extensions, fire pits, wall niches of varying sizes, and removed walls connecting adjoining cavates together that suggest a more complex configuration. In addition, Toll defines four attributes unique to Tsankawi cavates: cliff niches, vertical ceiling holes, groups of floor pits, and deep incisions in room walls.

³⁸ Toll, 1995, p. 13.



Floor, wall, and ceiling surfaces generally consist of plasters, smoke blackened tuff, and many incised petroglyphs in both surfaces. The floors are thick layers of plaster and the walls are smoothly plastered with a tan dado of many layers rising about 1 meter high where the ceiling vault springs from the wall. Some cavates contain

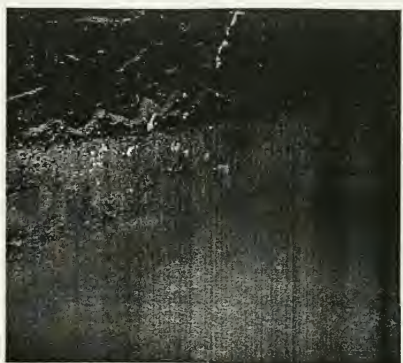


Figure 19: Cavate interior with niches, dado, and petroglyphs, 1997

complex plaster finishes of two or more colors. The ceilings are almost always smoke blackened with visible digging stick construction marks. There are often petroglyphs incised into this blackened layer that display a white sgraffito like figure from the substrate showing through. These often depict katchina, Kokopelli, and Awanyu (feathered serpent) figures (see Figure 19).

All of the publicly accessible cavates along the primary trail are found clustered in two rincons (of which the east facing one is the most densely clustered area) along the southeast and south sides of the mesa. This is where the trail ladder drops visitors down to cavates in the Tsirege tuff layer, though many more are found in the less accessible red Otowi tuff below. Another small cluster is found at the west mesa tip and is accessible via a secondary volunteer trail near the monument entrance. Due to the unsupervised



nature of a visit to Tsankawi, virtually all the cavates along the trail are visited by large numbers of people. The deleterious effects of such heavy visitation are immediately visible. Though the majority of the cavates are structurally stable, much surface damage is done by natural processes and visitation. The entrances to the cavates bear what may be the most significant damage. Heavy abrasion is visible from foot traffic to higher cavates, and entrance openings. Inside, detaching plaster and eroded tuff result from moisture percolation and salts and are often visible on the walls immediately around the entrances (see Figure 20). As well, the plaster floor directly inside the door is usually broken and worn away.

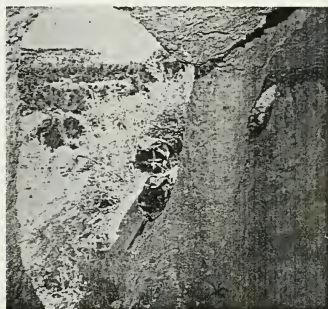


Figure 20:Eroded interior cavate entry

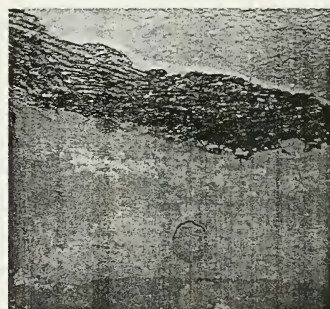


Figure 21: Fallen cavate ceiling, 1997

Walls fare somewhat better in terms of human damage with major and minor graffiti recorded in 23 of 246 surveyed cavates.³⁹ Natural deterioration of wall tuff and

³⁹ Toll, 1995, p. 102.



surface plaster treatments is widespread with severe erosion and deterioration in 74 of 248 cavates surveyed (30%) and no deterioration recorded in only 37 cavates (15%).⁴⁰ While the overall structural integrity of most cavates is high, a preliminary survey of examples randomly drawn from Toll's numerical categories by the University of Pennsylvania team in July 1997 found many plasters detached as well as tuff ceilings and walls disintegrating and powdering due to water infiltration and salt efflorescence (see Figure 21 and Appendix 6.3). The lower cavates in the softer red Otowi layer are particularly vulnerable to these processes and display much damage due to the poorly compacted red tuff, snow and rain percolation through the porous and jointed rock at the base of the mesa. Moreover, many lower cavates contain animal dung and display significant wall and floor damage presumably due to the historic practice of sheltering sheep and cattle in the lower cavates.

⁴⁰ Ibid. p. 104.



4.0 EVALUATION

From the distant outlying mountains of the Tewa sacred landscape to the tangible realities of deterioration of features such as the trails, the interaction of the physical landscape with the public, the National Park Service, and the Pueblo people has created a unique set of preservation problems at Tsankawi. All landscapes change and evolve, yet past management of the mesa has focused on the place as a "site," inferring static attributes. This attitude has led directly to the degradation of the site as described above largely through uncontrolled visitation and natural erosional problems. This pattern can be reversed or at least mitigated by making management and interpretation decisions based on culturally and ecologically sensitive preservation strategies that refer to the combined cultural and natural landscape for guidance. Only through this dual method of preservation planning can Bandelier proceed towards a solution of Tsankawi's cultural and physical issues. Bandelier has acknowledged the need for such a strategy and has, to their credit, begun planning for Tsankawi by weaving the natural and cultural together.

Future management of the mesa must focus on a culturally interactive dialogue with the San Ildefonso Pueblo. Respect for the religious justification of some pueblo decisions should be fully acknowledged. This does, however, bring up the issues of the time, place, and methods of Native use. NPS-28 states:

The National Park Service is steward of many of America's most important cultural, natural, and recreational resources. It is charged to preserve them unimpaired for the enjoyment of present and future generations....In keeping with the NPS organic act of 1916 and varied



historic preservation laws, park management activities must reflect awareness of the irreplaceable nature of these material resources.⁴¹

These ideas, and more importantly the methods that follow, may be in conflict with the traditional views and uses of the place. Bandelier must consider this when selecting management policies and intervention options for Tsankawi. Consequently, an active and confidential dialogue between the park and pueblo about sacred issues would add immensely to the preservation of pueblo cultural issues on the mesa.

4.1 Determining Priorities: Identification

All the features identified as major components of the cultural landscape are in need of preservation attention and monitoring. However, the feature in the most serious physical condition and requiring immediate attention is the trails. The complex system of trails covering the mesa is the primary vehicle for implementing both interpretive and preservation agendas at Tsankawi. These trails form the basis for prehistoric, historic, and contemporary circulation throughout the mesa area and, having experienced severe deterioration due to increased visitor use, are the logical focus for future work. This condition has caused their disuse and the creation of new paths-both of which will have devastating effects on the mesa and its environs.

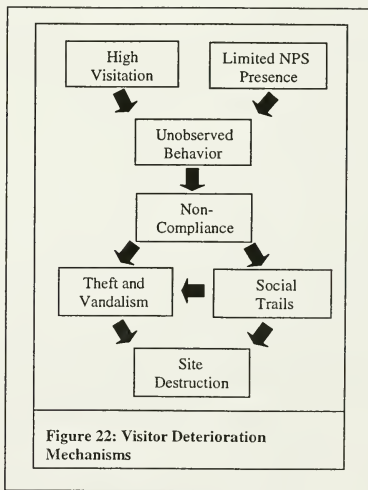
It is from these trails that the prehistoric puebloans accessed the mesa, and their descendants continue to do so for cultural practices. Today, large numbers of visitors

⁴¹USDI, *Cultural Resource Management Guideline, NPS-28*. Washington, D.C.:USDI/NPS, 1994, p.1.



access the mesa by these trails, and the National Park Service cautiously interprets from them for educational purposes. However, the trails do not exist independent from their environment and, damage to them translates into damage across the mesa (see Figure 22). This situation has resulted in damage to the mesa from large numbers of unobserved visitors who, either intentionally or unintentionally, have severely affected its physical and interpretive integrity.

In order to better manage and preserve Tsankawi, a major shift in trail management must take place. This major change requires a re-evaluation of the trail system and mitigation of the existing damage on the mesa in order to better manage, preserve, and interpret the site. Intervention is therefore necessary at both management and conservation levels. The primary intervention issues can be divided into two categories: trail preservation issues



and trail management issues. The remainder of this paper will focus on the physical preservation of the trails and the management of associated trail issues which include relaxed management, official onsite presence, and signage as the backbone and initial



steps of cultural landscape preservation at Tsankawi. While it is understood that management is the best form of "preventive conservation"- trail condition has surely deteriorated in many areas so as to require significant interventions at this point to remedy the damage already done.

4.2 Management Issues

The following management issues have been identified as contributing to trail damage on Tsankawi.

- Relaxed management
- Lack of official presence
- Inadequate signage

4.2.1 Relaxed management

Management has been minimal despite the mesa's designation as a "frontcountry" site. This is defined by Bandelier National Monument management policy as:

There may be some disruption to natural systems. Visitation may be high with high numbers of day-hikers, through-hikers, and stock-users. Party size may be large. The chance of seeing other visitors and/or park staff is very high. There may be evidence of human presence including man-made features. Trails may include all types. Overnight camping is prohibited. Established or recognizable day-use areas may exist. Visitors are generally interested in a wide range of social and recreational activities.⁴²

⁴² Bandelier National Monument gray material.



All aspects of this definition apply to Tsankawi except one: the chance of seeing other visitors and/or park staff is very high. Park employee impression is that visitation at Tsankawi is low, this could possibly be due to the 1995 Bandelier National Monument Visitor Study, which stated that only 5% of visiting groups came to Tsankawi. While this may be true of those visiting Frijoles Canyon, Tsankawi has a strong local repeat visitation that greatly increases its numbers. Further, the present honor system of paying for a trail guide by dropping money in a box cannot be relied on to indicate numbers particularly on a site with repeat local visitation. During the summer months, a dozen or more New Mexico licensed automobiles can be seen in the parking lot at one time.

4.2.2 Official Presence

Despite the high traffic on site, there is little official presence at Tsankawi and signage is minimal. While this absence adds greatly to a pristine visitor experience, it adds to the misunderstanding⁴³ and mistreatment of the mesa. "A single instance of off-trail hiking is often socially defined as an inconsequential rule violation. Such activity, however, is a major cause of human-impact problems at many park and forest recreation sites."⁴³ Park Ranger protection, tours, and interpretation though well meaning and honestly curious about the site, are voluntary, minimal and ill informed. In other National Park Service and National Forest locations, visitor noncompliance and vandalism studies have shown that the lack of a uniformed employee greatly increases the occurrence of noncompliant behavior.⁴⁴

Research suggests that the presence of a uniformed employee strengthens visitor beliefs that noncompliance will lead

⁴³ Darryll T. Johnson and Thomas C. Swearingen, "The Effectiveness of Selected Trailside Sign Texts in Detering Off-Trail Hiking at Paradise Meadow, Mount Rainier National Park," *Vandalism: Research, Prevention and Social Policy*, 1992, p. 104.

⁴⁴ Darryll R. Johnson and Mark E. Vande Kamp, "Extent and Control of Resource Damage Due to Noncompliant Visitor Behavior: A Case Study from the U.S. National Parks," *Natural Areas Journal*, Vol.16:2, April, 1996, p.134.



to negative social or legal consequences, even when that employee is not engaging in enforcement activity. The uniformed employee may also remind visitors of their own attitudes or personal norms that are inconsistent with noncompliance.⁴⁵

Although this suggestion may compromise Bandelier's desire to interfere as little as possible in the visitor experience, the addition of a roving ranger, possibly a puebloan Native American, would reduce the deterioration of the mesa.

4.2.3 Signage

Presently, the majority of signage exists as a small number of postings at the beginning of the trail, between the parking lot (past the visitor center) and the red tuff entry, two directional arrows, and the major sign indicating the pueblo ruin. "The last chance to influence the off-trail hiking behavior of park visitors is at or near sites such activity occurs-generally, with trailside signs."⁴⁶ Though locating signage near a protected or damaged area is a more effective and appropriate method of deterrence, the presently unobtrusive signage on the mesa is appropriate and faithful to Tsankawi's relatively unintrusive interpretation thus preserving its authentic character. However, the types of signage and wording should be revised to include Tewa language for interpretation purposes and to sure mandatory compliance.

⁴⁵ Mark E. Vande Kamp, Darryll R. Johnson, and Thomas C. Swearingen, "Preventing Visitor-Caused Damage To National Park Resources: What Do We Know? What Should Be Done," *Park Science*, Vol. 14:3, Summer, 1994, p. 8.

⁴⁶ Darryll T. Johnson and Thomas C. Swearingen, "The Effectiveness of Selected Trailside Sign Texts in Detering Off-Trail Hiking at Paradise Meadow, Mount Rainier National Park," *Vandalism: Research, Prevention and Social Policy*, 1992, p. 105.



4.3 Trail Preservation

Present trail conditions at Tsankawi compromise the physical, interpretive, and sacred integrity of the mesa. What the visitor sees and processes on Tsankawi are not the prehistoric conditions though they may be thought to be so. While the routes may be similar, visually the trails do not appear as they were during prehistoric use. Trail depths have been altered more than six feet in some places, original foot holds have been worn away, new routes have most likely been devised, and the rock surrounding the original paths has been scoured in many places. These changes have altered the erosion patterns, hydrology, vegetation, and visual appearance of the mesa. Arroyo formation is promoted, water channels down trails and into kivas, natural revegetation is suppressed, tuff blocks are destroyed, and open rock areas are blanched. Furthermore, the new social trails covering the mesa promote artifact hunting and compromise Native use of the area and the sacred nature of possible shrine locations. Due to these conditions, the fabric of the site is increasingly becoming compromised, and the resulting image that visitors leave with is a false one formed by heavily eroded trail conditions, contemporary circulation patterns, and inappropriate trespass.

Trail preservation measures must address all of the above issues in such a way as to establish a culturally and physically appropriate method of preservation and maintenance which will provide for future decisions in management or interpretation. Proper measures will include a thoughtful balance of as many of the following primary issues as possible.

- Cultural and Physical Appropriateness:



Is the measure acceptable to traditional uses and belief systems of the San Ildefonso Pueblo and other pueblo affiliates?

Is the measure focused on the deterioration, minimally intrusive, and sufficient to solve the problem?

- Visual impact- how will the measure affect the site and surrounding landscape?
- Reversibility- if an alteration to the fabric is affected, can it be removed without damage to the original fabric or the environment?
- Durability- will the measure withstand the natural weathering and human impacts and not cause damage to the trail?
- Sustainability- is the measure cost efficient and easy enough to maintain on a regular basis?

4.4 Recommendations

The following measures are intended not as absolute implementation recommendations, but as suggestions as to what aspects of cultural and physical landscape preservation may be focused on in the near future. These have been divided into six general categories:

1. Management
2. Official presence
3. Signage
4. Vegetation



5. Trails
6. Further study

4.4.1 Management

- Management of the mesa should be converted from the historically based techniques of passive and minimal attention to a more active but not necessarily more intrusive method. While historical inattention has helped lead to the enormously effective visitor experience that exists on the mesa, it has also led to many of the problems that are destroying the site. A possible starting point may be Tsankawi Alternative A in the Development Concept Plans: Frijoles Canyon and Tsankawi. (1995).
- Increased management must proceed in unison with increased if not total participation of the San Ildefonso Pueblo. Culturally the site belongs to them and their interpretation, advice, concerns, and prohibitions concerning Tsankawi should not only be carefully considered, but actively sought out.
- An integrated management plan that recognizes the interdependence of cultural and natural resources, from both ethnographic and ecological viewpoints, should arise from the present attempts at integrating the two aspects in management and policy.

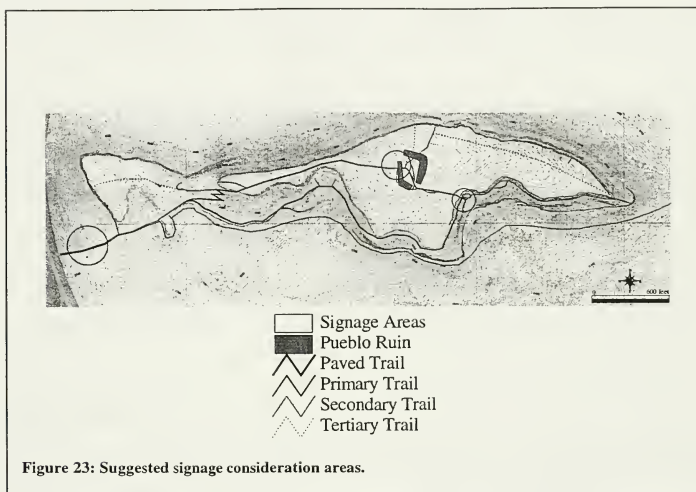


4.4.2 Official Presence

- A further source of the damage to the mesa is the lack of an official presence on the site. Placing a full time ranger on a roaming position on Tsankawi would both deter most forms of non-compliant behavior and increase interpretation without further physical intrusions to the minimal nature of the site.
- The above establishment of an official presence assumes an advanced understanding of the culture, physical nature, and history of the site. In order for this to be true, a program should be instituted to train potential Tsankawi rangers in these areas. Not only might this offer the park employees the potential to become more interested in the mesa, but would instill a stronger interest parkwide.
- An increased interest in Tsankawi should be promoted outside the monument, particularly at San Ildefonso, as well. The introduction of a site stewardship program, establishing a person to regularly visit and monitor behavior and conditions on the mesa, perhaps with some of the younger members of the Pueblo, could be helpful in both increasing awareness and monitoring conditions on Tsankawi as well as leading to employment in heritage management.



4.4.3 Signage (see Figure 23)



- Signage, as it is today, should be kept to a minimum in order to preserve the natural quality of the site through minimally intrusive interpretation.
- While signage is most effective near the subject of interpretation and the area of non-compliance, locating more information in and near the visitor center would be effective in interpretation and non-compliance deterrence.⁴⁷

⁴⁷ Johnson and Swearingen, 1992, p.103-120.



- The pueblo ruin sign on the mesa top is intrusive and interferes with the viewshed from the mesa; it should either be removed or redesigned to be much lower to the ground.
- A temporary sign should be considered for the area immediately at the bottom of the ladder to the cavate area. The amount of non-compliance and trail/cavate deterioration resulting from visitor roaming is particularly concentrated here and should be immediately confronted.
- Information on site erosion, and preservation should be introduced at the visitor's center.

4.4.4 Vegetation

- The groundcover on and around the pueblo is heavy and severely decreases the readability of the ruin. Wall outlines are barely visible and the root systems are more than likely damaging subsurface walls and artifacts. Removal of herbaceous vegetation would reduce these damaging activities as well as facilitate any survey/mapping on the mesa top pueblo. A controlled burn may be beneficial, but should not be carried out until Recommendation #6-Study of Subsurface Heating Effects of the *Dome Fire Cultural Resources Damage Assessment and Treatment Project: 1996 Progress Report, Review Draft, 1998* is completed.
- Plantings of living and skeletal remains should be considered for effectively closing off social trails, particularly on the mesa top. This method would become essentially



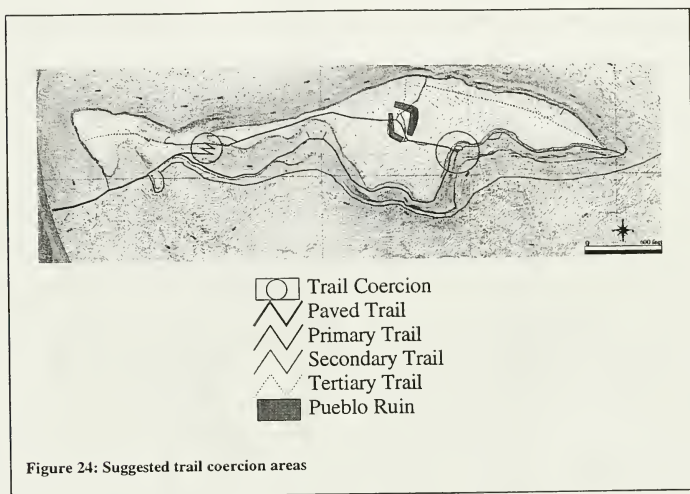
unnoticeable to visitors and would introduce no new flora if local species like saltbush and apache plume are used.

4.4.5 Trails

The trails, again, are the most complicated and difficult portion of assessing Tsankawi as they are linked to all other issues on the mesa. The following recommendations are offered in consideration of the entire mesa and the interconnectedness achieved through the intricate relationships between the trails and the rest of the site. As well, they are designed to be implemented during the summer field work session scheduled for May-August 1998.

- Trail Coercion (see Figure 24)

Small steps taken to deter off trail hiking and social trail formation have the potential of being extremely effective in reducing visitor non-compliance. As mentioned above, native vegetation plantings at the beginnings of social trailheads could slow or stop the formation and use of these damaging circulation routes. These secondary and tertiary trails bring the visitors over the entire mesa, increasing the damage to the resources and threatening the possible locations of directional shrines on the mesa. In addition, lines of small rocks along trail edges, like those that already exists on some parts of the trail, may also deter off trial hiking. This method might be initially tried along the switchbacks before trail marker #6 where significant damage is being done by switchback cutting and off trial hiking to petroglyph panels.

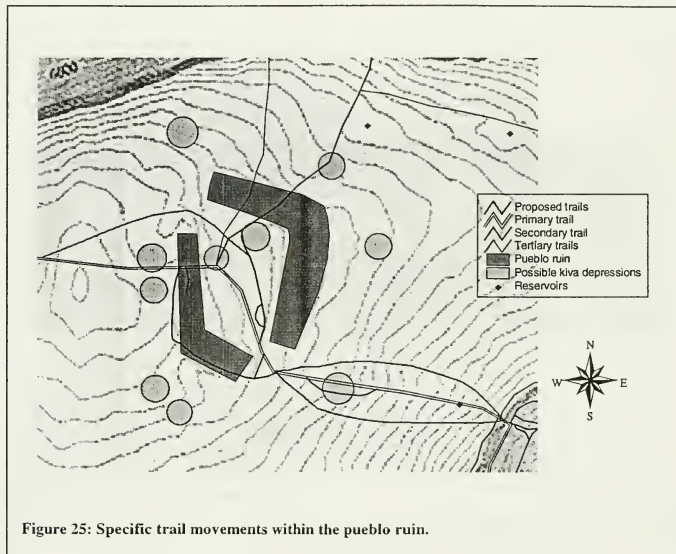


- Trail Movement (see Figures 25 & 26)

Several areas of trail must be moved due to their threat to the physical and cultural resources on Tsankawi. Particularly so within the pueblo ruin, the location of the official trail severely impacts the structural resource (the walls) as well as the archaeological (the artifacts). The trail from the northwest corner should be moved further north in order for it to enter the pueblo through a break in the walls instead of running over them. Within the pueblo, the trail should be linked to an existing secondary trail near the east-end of the plaza which leaves the pueblo at the southeast corner. This would remove the trails



from the kivas within the pueblo. Due to the particularly sensitive nature of the pueblo area, all trail movements here must be verified by San Ildefonso.



Once outside, at the southeast corner, the trail should be moved either to the north or south of its present route through the kiva.

The top of the mesa presumably contains a number of sites spiritually sensitive to San Ildefonso, such as kivas and directional shrines, and the placement of trails both inside and outside the pueblo should be sensitive to these areas. A final area for trail movement consideration is the segment around trail markers #17 and #18. This area



is known to contain burials and should be avoided for cultural and archaeological reasons.

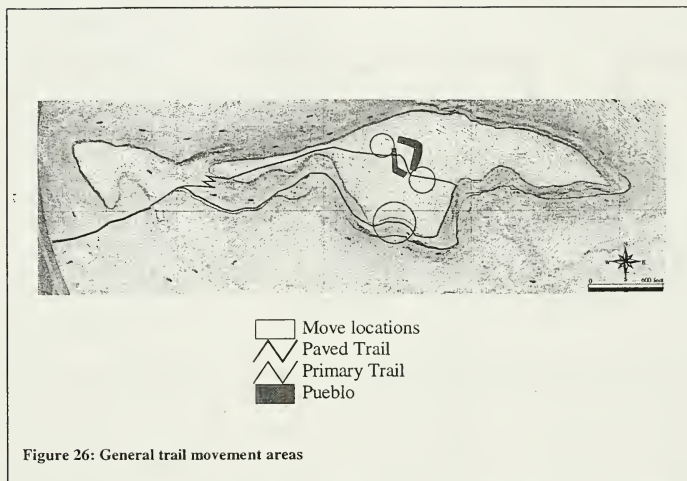


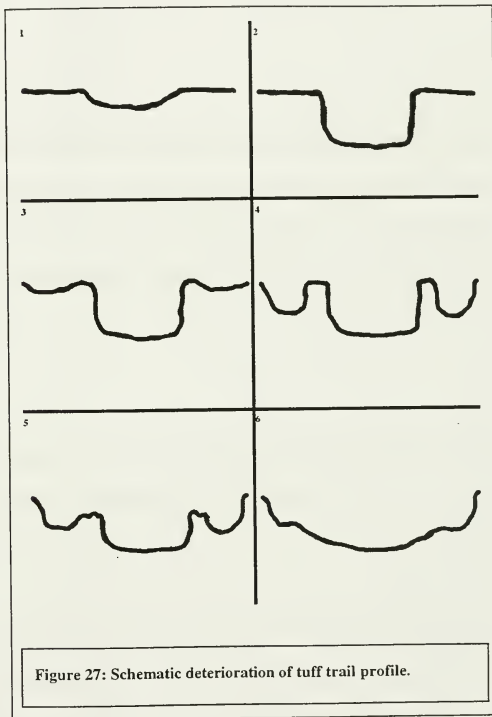
Figure 26: General trail movement areas

- Trail Fill

Due to the heavy foot traffic on the mesa, the tuff trails have become severely eroded and will continue to erode unless damage is mitigated. The resulting situation is dangerous to visitors and promotes a general pattern of trail erosion throughout the mesa demonstrating a much transformed profile bearing little resemblance to original trail shapes. (see Figure 27) This alters the hydrology on the mesa, which in turn affects vegetation and the deterioration of the cavates below.



1. Initial prehistoric wear
2. Prehistoric/historic trough creation
3. Visitors avoiding trail due to depth begin to walk on either side, creating adjacent trails
4. Visitors continue this use pattern until tuff fins form on either side of the main trail



5. Tuff fins break off and create a much wider trail
6. Tuff fins are worn down and a wider area of tuff is exposed as the trail.



Various options can be implemented in an attempt to control the damage to the tuff.

- No intervention

The no intervention route is not an option unless the site is closed to the public.

- Cement-rubble fill

Cement-rubble fill would bring the trails back up to their prehistoric levels, but would be far too damaging to the tuff. The differential between such hard and soft materials would most likely erode the tuff around the cement and cause drainage problems. More importantly, such a permanent solution would prove irreversible and is therefore unacceptable.

- New trails

Creating new trails alongside the present system would only create the same problems in new locations causing major visual and physical disfigurement.

- Stone consolidation

This method is not viable due to the soft nature of the tuff. Consolidation with ethyl silicate consolidants would significantly harden the rock where the consolidant has been applied, creating a strong differential between the existing fabric and the consolidated one which would lead to delamination and further deterioration of the



tuff.⁴⁸ Moreover, the consolidant is toxic, difficult to apply, expensive, requires high maintenance, and may be culturally inappropriate to San Ildefonso.

- Walkways

Placing walkways above either all of the trail or the particularly deteriorated sections is one of the most viable options for trail preservation. It is entirely reversible, placing little impact on the physical environment while effectively protecting the site. However, intrusion on the landscape would be severe and would seriously compromise the visual integrity of the site. Further walkways would require high maintenance and would be difficult to design on uneven lengths of trail.

- Compatible Trail Fill

Placing a compatible trail fill within the deep troughs cut into the tuff offers the most viable solution for Tsankawi trail preservation and is recommended for the summer 1998 scope of work. As an option, compatible trail fill allows continuing trail usage while protecting and preventing future trail abrasion. Compatible trail fill should be placed in those trails with a profile matching or similar to stages 2, 3, and 4 of the Figure 27 profile. Fill material must protect and not exacerbate present or future damage the existing fabric, and is reversible, sustainable, easy to maintain,

⁴⁸ Based on studies of treated samples at the Architectural Conservation Laboratory, University of Pennsylvania, 1997-98.



inexpensive, visually compatible with the tuff and landscape, allows drainage control, and is culturally appropriate.

- Further Study

The recommendations made in this report address specific physical preservation issues in the context of Tsankawi as a cultural landscape. Many other issues must be addressed before further action and management decisions are made in order to provide the fullest scope of recommendations and management decisions for the mesa.

1. Tsankawi Archive

An archive consisting of all material relevant to Tsankawi should be developed and installed in Bandelier National Monument. The Access® database found in Appendix 4 represents sources found and utilized for this study, and should be used as a foundation for future archives.

2. Hydrology Study

Due to the striking topology and water channeling effects of trails on Tsankawi, a hydrology study should be done to assess water flow and its impact on the cultural resources, particularly the cavates.

3. Cavate Survey



Tsankawi cavates as a resource type were well documented by Toll in 1995, but a complete study of cavate mapping (including the recordings of Lister and Toll) and conditions still needs to be done. Decisions as to how to protect and manage these complicated and fragile structures cannot be made unless a detailed diagnosis of plasters and conditions is made. Further, decisions as to the option and methodology of closing off cavates to the public cannot be made without such a study (see Appendix 6.3).

4. Detailed Survey of Pueblo Area

Conflicting archaeological records have confused the facts about the mesa top pueblo. A detailed survey of this area is needed to define natural and cultural characteristics of the site before any further trail or archaeological work is done. If possible, this should be done in conjunction with controlled burn and revegetation.

5. Geographic Information Systems

Some of the maps for this report were created in ArcView®, a GIS program from ESRI. The full potential of the program was not utilized however and management of the mesa would greatly benefit from further work in this area. Cultural Resource Management through GIS is becoming increasingly popular and useful, and the potential for resources as well as text/graphic relational database management of Tsankawi in conjunction with a GIS system is enormous and should seriously be



studied. The development of cultural landscape issues in GIS is coming to the forefront and may be considered for future projects in Bandelier National Monument.

6. 3-D Model

The pueblo, cavates, and trails on the mesa are inextricably linked temporally, socially, and spatially. In order to fully represent and study the multi-dimensional nature of the place, a three-dimensional model of the mesa should be created. ArcView® or ArcInfo® (a more powerful and specific GIS designed by ESRI) have these capabilities and could be used in conjunction with aerially based microtopographic surveys.



5.0 BIBLIOGRAPHY

- Australia ICOMOS, *The Australia ICOMOS Charter for the Conservation of Places of Cultural Significance (The Burra Charter)*, 1981.
- Bailey, R.A., R.L. Smith, and C.S. Ross. *Stratigraphic Nomenclature of Volcanic Rocks in the Jemez Mountains, New Mexico*. U.S. Geological Survey Bulletin 1272-P. U.S. Printing Office, Washington, p. 13
- Bandelier, Adolph F., *Final Report of Investigations Among the Indians of the Southwestern United States, Carried on Mainly in the Years from 1880 to 1885*. Cambridge: John Wilson and Sons, 1892.
- Bandelier National Monument. *Environmental Management Committee Meeting Minutes*. Ms. On file, 1996.
- *Resources Management Plan*. Los Alamos, NM, 1995.
- Barry, Patricia., *Bandelier National Monument*. Tuscon, AZ: Southwest Parks and Monuments Association, 1990.
- Beam, George L., *The Prehistoric Ruin of Tsankawi*. National Geographic Magazine 20: 807-822, 1906.
- Christensen, Harriet H., Darryll R. Johnson, and Martha H. Brookes ed., *Vandalism: Research, Prevention, and Social Policy*. General Technical Report PNW-GTR-293: Portland, OR, U.S. Department of Agriculture, 1992.
- Cleere, Henry, ed., *Archaeological Heritage in the Modern World*. Boston: Unwin Hyman, 1988.
- Cowley, Jill, *Canyon De Chelly-An Ethnographic Landscape*. CRM. Vol.14- No.6,10/11, 1991.
- Davis, Carl, Tom Russell, Jill Osborn, and Dennis Shrader. *Life Beyond Inventory: Cultural Resource Site Protection on National Forest Lands in Oregon*. Vandalism: Research Prevention, and Social Policy, H. Christensen, D. Johnson, M. Brookes ed. Portland, OR. U.S. Department of Agriculture, 1992.



- Dozier, Edward P., *The Role of Hopi-Tewa Migration Legend in Reinforcing Social Patterns and Reinforcing Social Behavior*. Journal of American Folklore 69:271/274, 1956.
- Dunmire, William W., and Gail D. Tierney, *Wild Plants of the Pueblo Province*. Santa Fe: Museum of New Mexico Press, 1995.
- Ebert, James I., *Photointerpretive Mapping of Visitor and Animal Trails in Bandelier National Monument: A Possible Approach to Determining Potential for Impact On Cultural and Natural Resources*. Santa Fe: National Park Service, 1981.
- Ellis, Dr. Florence H., *San Ildefonso and the Prehistoric San Ildefonsoans*. Prepared for The Bureau of Indian Affairs, USDI, 1967.
- Ford, Richard Irving, *An Ecological Analysis Involving the Population of San Juan Pueblo, New Mexico*. Dissertation, University of Michigan, 1968.
- Goff Stephen et al. *The Valles/Toledo Caldera Complex, Jemez Volcanic Field, New Mexico*. Annual Review of Earth and Planetary Sciences, 1990.
- Harrington, John P., *Ethnogeography of the Tewa Indians*. Washington D.C.: Smithsonian Institution, 1916.
- Henderson, Junius, and John Peabody Harrington, *Ethnozoology of the Tewa Indians*. Washington, D.C.. U.S. Government Printing Office, 1914.
- Hewett, Edgar Lee, *Antiquities of the Jemez Plateau*. Washington D.C.: U.S. Government Printing Office, 1906.
- Higgins, Howard C., *Rock Art Vandalism: Causes and Prevention*. Vandalism: Research Prevention, and Social Policy, H. Christensen, D. Johnson, M. Brookes ed. Portland, OR. U.S. Department of Agriculture, 1992.
- Hill, W.H., *The Ethnography of Santa Clara Pueblo, New Mexico*. Albuquerque: University of New Mexico Press, 1982.
- Hoard, Dorothy, *A Guide to Bandelier National Monument*. Los Alamos, New Mexico: Los Alamos Historical Society, 1983.
- , *Los Alamos Outdoors*. Los Alamos, New Mexico. Los Alamos Historical Society, 1981.



- Johnson, Chester R., Jr., *Report on the Excavation of a Child's Burial in Cave Room C54, Tsankawi Ruin, Bandelier National Monument*. Ms. on file. Bandelier National Monument, 1960.
- Johnson, Darryll R. and Mark E. Vande Kamp, *Extent and Control of Resource Damage Due to Noncompliant Visitor Behavior: A Case Study from the U.S. National Parks*. Natural Areas Journal. Vol. 16- No. 2, 134/141, 1996.
- Johnson, Darryll, R. and Thomas C. Swearingen, *The Effectiveness of Selected Trailside Sign Texts in Deterring Off-Trail Hiking at Paradise Meadow, Mount Rainier National Park*. Vandalism: Research Prevention, and Social Policy, H. Christensen, D. Johnson, M. Brookes ed. Portland, OR. U.S. Department of Agriculture, 1992.
- Kwas, Mary L., ed., *Archaeological Parks: Integrating Preservation, Interpretation, and Recreation*. Nashville, TN. Department of Conservation, Division of Parks and Recreation, 1986.
- LA 211, Tsankawi Pueblo, Laboratory of Anthropology site file, ms. on file, Bandelier National Monument.
- Lange, Charles H., and Carroll L. Riley, *The Southwestern Journals of Adolph Bandelier*, Lange, Charles H., Carroll L. Riley, and Elizabeth M. Lange, *The Southwestern Journals* Press, 1975.
- Los Alamos National Laboratory, Brief Climatology for Los Alamos New Mexico, internet, <http://weather.lanl.gov/html/climatology.html>.
- Maritinez Esther, *Tewa Dictionary*, San Juan Pueblo. 1982.
- Mathien, Frances Joan, Charlie R. Steen, and Craig D. Allen. *The Pajarito Plateau: A Bibliography*. Santa Fe, NM: Southwest Cultural Resources Center Professional Papers No. 49, 1993.
- McGimsey, Charles R. III, and Hester A. Davis, ed., *The Management of Archeological Resources, The Airlie House Report*. Lawrence, KS: Society for American Archaeology, 1977.
- Mera, H.P., *A Survey of the Biscuit Ware Area in Northern New Mexico*. Laboratory of Anthropology Technical Series Bulletin No. 6. Santa Fe, 1934.
- Mera, H.P. Field Survey, Tsankawi, Sheetmap 777/20 (ARMS), c. 1935.



- Mindeleff, Cosmos, *Aboriginal Remains on Verde Valley, Arizona*. In Thirteenth Annual Report of the Bureau of American Ethnology, by J W., Powell, p. 179-261. U.S. Government Printing Office, Washington D.C., p. 217.
- Morain, Stanley A., Michael White, and Amelia Komarek, *Remote Detection of Culturally Disturbed Sites in Bandelier National Monument*. Ms. on file: Bandelier National Monument, 1978.
- National Park Service. *Cyclic Maintenance for Historic Properties-Project Proposal Form-FY-98*. Intermountain Region ms. On file, 1988.
- Naranjo, Tito, *Healing Spaces in the Tewa Pueblo World*. American Indian Culture and Research Journal. 13:3/4, 1989.
- Nordby, Larry V., *Ruins Preservation in the Southwest*. American Archaeology. Vol. 3, No.3, 216/218, 1983.
- Ortiz, Alfonso, *The Tewa World: Space Time, Being and Becoming in a Pueblo Society*. Chicago: University of Chicago Press, 1969.
- Parker, Patricia L., and Thomas F. King. *Guidelines for Evaluating and Documenting Traditional Cultural Properties*. National Register Bulletin 38. Washington, 1990.
- Parsons, Elsie C., *Tewa Tales*. The American Folklore Society: New York, 1926.
- Parsons, Elsie C., *The Social Organization of the Tewa of New Mexico*. Memoir No. 36. Menasha, WI.: American Anthropological Association, 1929.
- Powers, Robert P and Janet D. Orcutt (ed.). in press, *The Bandelier Archaeological Survey*. Contribution No. 9 of the Bandelier Archaeological Survey. National Park Service, Santa Fe.
- Powers, Robert P., *The Bandelier Archaeological Survey 1987 Preliminary Report*. Ms. On file. Branch of Cultural Research, National Park Service: Santa Fe, 1988.
- Richert, Roland Von S., and R. Gordon Vivian, *Ruins Stabilization in the Southwestern United States*. Washington: National Park Service, 1974,
- Robbins, Wilfred W., John P. Harrington, and Barbara Freire-Marreco, *Ethnobotany*



- of the Tewa Indians. Bureau of American Ethnology, Bulletin No. 55. Washington, D.C.: Smithsonian Institution, 1916.
- Rohn, Arthur H., *The Rock Art of Bandelier National Monument*. Albuquerque: University of New Mexico Press, 1989.
- Rothman, Hal, *Bandelier National Monument, An Administrative History*. Santa Fe, NM: Southwest Cultural Resources Center Professional Papers No. 14, 1988.
- Schub, Lisa C., Michael Elliott, Earl C. Ruby, *Dome Fire Cultural Resource Damage Assessment and Treatment Project: 1996 Progress Report*. Draft, Bandelier National Monument, 1998.
- Sneed, James E. and Robert W. Preucel. *The Ideology of Settlement: Ancestral Keres Landscapes in the Northern Rio Grande*. Unpublished ms., 1997.
- Steen, Charlie R., *Pajarito Plateau Archaeological Survey and Excavations- LA-8860-NERP*. Los Alamos, NM: Los Alamos Scientific Laboratory, 1977.
- Pajarito Plateau Archaeological Survey and Excavations, II- LA 8860-NERP*. Los Alamos, NM: Los Alamos Scientific Laboratory, 1982.
- Thompson, M.W., *Ruins: Their Preservation and Display*. London: British Museum Publications, 1981.
- Toll, H. Wolcott with contributions by Peter J. McKenna and June Crowder, *An Analysis of Variability and Condition of Cavate Structures in Bandelier National Monument*. Santa Fe, NM: Intermountain Cultural Resources Center Professional Paper No. 53, 1995.
- , H. Wolcott, *Cavates: History, Recording Procedure, Condition, Features, Form, and Function of a Sample from Bandelier National Monument*. Ms. on file, Branch of Cultural Research. Santa Fe: Branch of Cultural Research, 1988.
- Turney, John Francis, *Bandelier Survey*. Ms on file. Bandelier National Monument, 1962.
- USDI, *Cultural Resource Management Guideline, NPS-28*. Washington, D.C.: National Park Service, 1994.



-----, *36 CFR Part 61, Procedures for State, Tribal and Local Government Historic Preservation Programs; Proposed Rule*. Washington, D.C., National Park Service, 1996.

----- *How to Evaluate and Nominate Designed Historic Landscapes*, *National Register Bulletin 18*. Washington, D.C: National Park Service.

----- *Guidelines for Evaluating and Documenting Rural Historic Landscapes*, *National Register Bulletin 30*. Washington, D.C: National Park Service.

U. S. Public Law 59-209, 34 Stat. 335, Act for the Preservation of American Antiquities, 1916.

U.S. Public Law 64-235, 39 Stat. 535, National Park Service Act, 1916.

Vande Kamp, Mark E, Darryll R. Johnson, Thomas C. Swearingen, *Preventing VisitorCaused Damage to National Parks*. Park Science. Vol.14-No.3, Summer, 1994.

Whitman, William 3rd., *The Pueblo Indians of San Ildefonso*. New York: AMS Press, 1947.



6.0 APPENDICES



1 Appendix I- Photographic Comparisons

Comparison 1, Panoramic Views



Photo 1: mesa top panorama, Jesse L. Nusbaum, ca. 1915-1920. Note prevalence of exposed tuff masonry blocks. (Museum of New Mexico Photo Archives)



Photo 2: mesa top panorama, 1997. Note dense herbaceous vegetation obscuring masonry. (Architectural Conservation Laboratory)



Comparison 2, Aerial Views

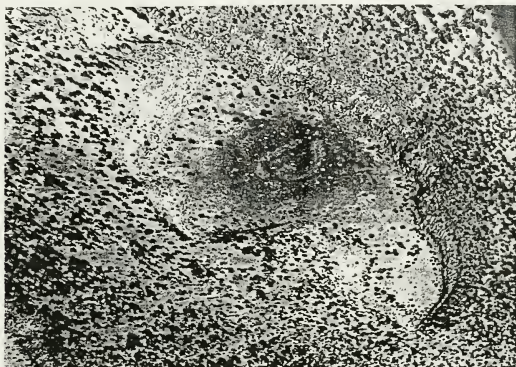


Photo 3: mesa top pueblo, aerial, Charles A. Lindberg, 1929. Note absence of the pueblo volunteer trails as established later in Photo 4. (Museum of New Mexico Photo Archives)

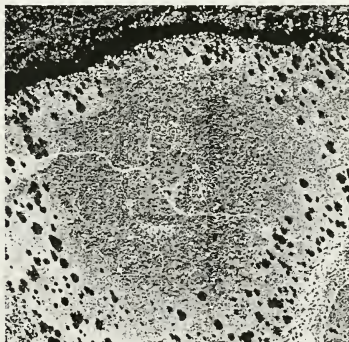


Photo 4: mesa top, aerial, 1950's? (Bandelier National Monument Archives)



Comparison 3, Red tuff trailhead



Photo 5: Carved red tuff stairs, ca. 1920. (Bandelier National Monument Archives)



Photo 6: Severely eroded red tuff trailhead, not loss/removal of stairs, 1997 (Bandelier National Monument Archives)



Comparison 4, Crevice erosion

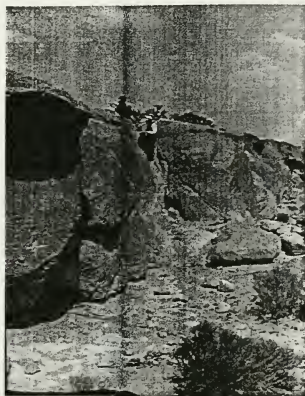


Photo 7: crevice with Judge Abbott? At marker #6, ca. 1890 (Bandelier National Monument Archives)

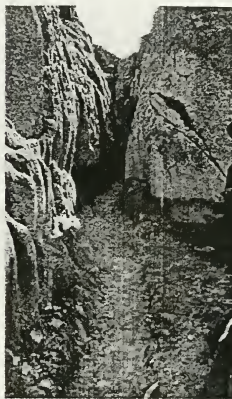


Photo 8: crevice, ca. 1917 (Bandelier National Monument Archives)



Photo 9: crevice, date unknown (Bandelier National Monument Archives)



Comparison 5, Trail Abrasion



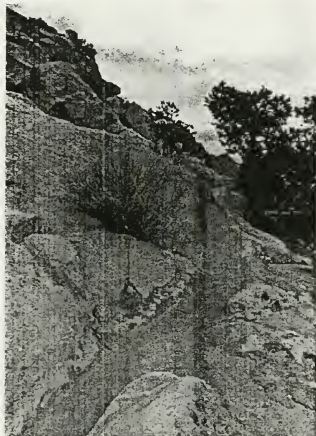


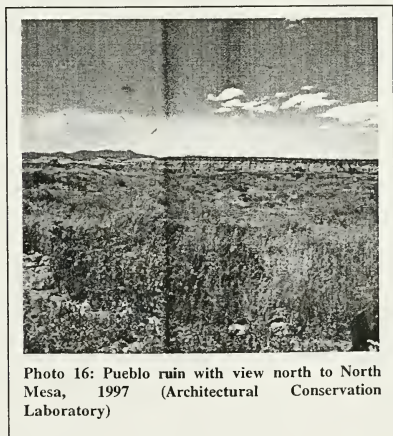
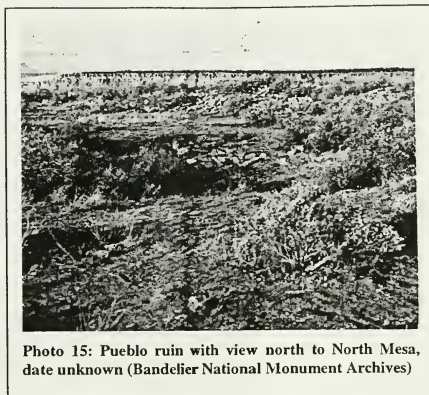
Photo 13: worn trail, date unknown
(Bandelier National Monument Archives)



Photo 14: worn trail, 1997 (Architectural
Conservation Laboratory)



Comparison 6, Mesa top view north





6.2 Appendix 2- Tsankawi Mesa



- Paved trail
- Primary trails
- Secondary trails
- Tertiary trails
- Pueblo ruin
- Possible kiva depressions
- Major cavate clusters
- Reservoirs
- Major petroglyph panels
- Ladder Access
- Trail markers



Map Sources:

Features-UPENN field work, July 1997

-Bandelier Archaeological Survey Site
Locations Map, Tsankawi, NPS,
1987-1991

-----Structural Features Map, no date

Base Map- State Plane Coordinate Grid System,
New Mexico Central Zone. 1983 North
American Datum, Los Alamos National
Laboratory



Appendix 6.3 Representative Cavate Survey

This appendix is intended to provide a representative model for the detailed survey of cavate conditions based on Toll's 1995 report. While Toll provided a good base for cavate classification by feature occurrence and typology, further qualitative recordation of conditions is now required to develop a treatment program for each cavate. The University of Pennsylvania project carried out a pilot, randomly sampled survey as an example of what can be done in the future to properly monitor cavate feature condition.

Toll conveniently classified cavate structural condition into room stability categories of "apparently stable", "lesser threat/greater threat," and "major problem." Due to the generally unrecordable condition of features in the major problem category, these cavates were not included in the University of Pennsylvania survey. However, within the "apparently stable," "lesser threat," and "greater threat" categories, three cavates were surveyed for feature conditions concerning the material as well as structural stability of the cavate.



**SITE CONDITION ASSESSMENT
TSANKAWI MESA
BANDELIER NATIONAL MONUMENT**

Site: Tsankawi (LA50976)

Feature: Cavate

Group/Sector : C

Room\Area: 59

Toli Assessment: Apparently Stable

Examined by: Frank Matero/Shawn Provencher

Date: 7/2/97

1.0 STRUCTURAL FEATURE SUMMARY DATA

Feature Type: Cavate

Dimensions and axes:

length: 13x10 ft

width: 11x7 ft

dia(min): 15x9 ft

dia(max): 15x9 ft

height: 6x7 ft

wall thick(top): 32in.

basal: 18in.

Context: isolated/contiguous/open/sheltered/other:

*Part of group enclave.

Exposure/Orientation (facing):

Closed/South

Moisture: wet/dry

Vegetation: none

Plan: circular/ovate/D-shaped/quadrilateral/unknown/other:

*With rounded corners

Section/elevation:

subterranean/semi-subterranean/surface/1-story/2-story/multiple story

*Domed



Site: Tsankawi (LA50976)

Feature: Cavate

Group\Sector : C

Room\Area: 59

Toll Assessment: Apparently Stable

Examined by: Frank Matero/Shawn Provencher

Date: 7/2/97

2.0 DETAIL DESCRIPTION

Walls: natural rock/stone

Type: grey tuff

Wall Features: pilasters/banquette/shelf/niche/ventilator

doorway/wall

peg/loop/socket/other:

Surface

Finish:

undressed/simple/fracture/pointed/pecked/rubbed/obscured/other:

3.0 SURFACE FINISHES

Type: paint/plaster: defacto/basecoat/finish coat-single/multiple

No. layers: 2

Application: monochrome/bichrome/floor band/dado/aura/other:

Height Applied: 27-29in.

Color(s): red/brown/tan/white/grey/black/blue/green/other:

Surface Attibutes: fingerprints/striated/sooted/fire-reddened/other:

*Walls relatively free of soot as opposed to walls.

Rock Art/design:

*Awanyu and Katchinas entire length above dado.

4.0 DOCUMENTATION:

*Photos taken 7/2/97

p.2



Site: Tsankawi (LA50976)

Feature: Cavate

Group\Sector : C

Room\Area: 59

Toll Assessment: Apparently Stable

Examined by: Frank Matero/Shawn Provencher

Date: 7/2/97

5.0 STRUCTURAL FEATURE CONDITION

Plaster/Stone Conditions [P=Plaster, S=Stone]

Occurrence of condition (% of Surface Area):

0= Non-Existent 1=Low (<25 %) 2=Moderate (25-50 %) 3=High (>50 %)

	Walls	Floor	Ceiling	Other
Loss	p-1/s-0	-	-	-
Part. Loss	p-1/s-0	-	-	-
Mech. Damage	p-1/s-1	-	-	-
Delamination	p-1/s-0	-	-	-
Detachment	p-1/s-0	-	-	-
Displacement	-	-	-	-
Lin. Cracking	p-1/s-0	-	-	-
Map-cracking	p-1/s-0	-	-	-
Bistering	p-0/s-0	-	-	-
Color change	p-0/s-0	-	-	-
Surf. Deposits:				
Salts	p-0/s-0	-	-	-
Excrement	p-0/s-0	-	-	-
Carbon Soot	p-1/s-3	-	-	-
Prev. repairs	p-0/s-0	-	-	-
Graffiti	p-1-2/s-1-2	-	-	-
Visitor wear	p-0/s-0	-	-	-
Biological growth	p-0/s-0	-	-	-
Vegetation	p-0/s-0	-	-	-

*Only major loss of plaster and stone at NE corner to right of door from weathering.

p.3



**SITE CONDITION ASSESSMENT
TSANKAWI MESA
BANDELIER NATIONAL MONUMENT**

Site: Tsankawi (LA50976)

Feature: Cavate

Group\Sector : C

Room\Area: 50/534

Toll Assessment: Greater Threat

Examined by: Frank Matero/Shawn Provencher

Date: 7/2/97

1.0 STRUCTURAL FEATURE SUMMARY DATA

Feature Type: Cavate

Dimensions and axes:

length: 148in. **width:** 86in.

dia(min): 152in.

dia(max): 155in.

height: 57in.

wall thick(top): 19in.

basal: 17in.

Context: isolated/contiguous/open/sheltered/other:

*Exposed

Exposure/Orientation (facing):

Contained/East

Moisture: wet/dry

Vegetation: none

Plan: circular/ovate/D-shaped/quadrilateral/unknown/other:

Section/elevation:

subterranean/semi-subterranean/surface/1-story/2-story/multiple story

*Shallow domed ceiling.



Site: Tsankawi (LA50976)

Feature: Cavate

Group\Sector : C

Room\Area: 50/534

Toll Assessment: Greater Threat

Examined by: Frank Matero/Shawn Provencher

Date: 7/2/97

2.0 DETAIL DESCRIPTION

Walls: natural rock/stone

Type: grey tuff

Wall Features: pilasters/banquette/shelf/niche/ventilator

doorway/wall
west.

peg/loop/socket/other: *Storage unit in rear

Surface

Finish:

undressed/simple/fracture/pointed/pecked/rubbed/obscured/other:

3.0 SURFACE FINISHES

Type: paint/plaster: defacto/basecoat/finish coat-single/multiple

No. layers: 2

Application: monochrome/bichrome/floor band/dado/aura/other:

Height Applied: 29in.

Color(s): red/brown/tan/white/grey/black/blue/green/other:

Surface Attributes: fingerprints/striated/sooted/fire-reddened/other:

Rock Art/design:

4.0 DOCUMENTATION:

*Photos taken 7/2/97

p.2



Site: Tsankawi (LA50976)

Feature: Cavate

Group\Sector : C

Room\Area: 50/534

Toll Assessment: Greater Threat

Examined by: Frank Matero/Shawn Provencher
7/2/97

Date:

5.0 STRUCTURAL FEATURE CONDITION

Occurrence of condition (% of Surface Area):

0= Non-Existent 1=Low (<25%) 2=Moderate (25-50%) 3=High (>50%)

	Walls	Floor	Ceiling	Other
Loss	p-3/s-2n	-	-	-
Part. Loss	p-3/s-2n	-	-	-
Mech. Damage	p-0/s-0	-	-	-
Delamination	p-1/s-3	-	-	-
Detachment	p-0/s-3	-	-	-
Displacement	p-0/s-0	-	-	-
Lin. Cracking	p-0/s-0	-	-	-
Map-cracking	p-0/s-0	-	-	-
Bistering	p-0/s-0	-	-	-
Color change	p-0/s-0	-	-	-
Surf. Deposits:				
Salts	p-0/s-0	-	-	-
Excrement	p-0/s-0	-	-	-
Carbon Soot	p-2/s-0	-	-	-
Prev. repairs	p-0/s-0	-	-	-
Graffiti	p-0/s-0	-	-	-
Visitor wear	p-0/s-0	-	-	-
Biological growth	p-0/s-0	-	-	-

p.3



Vegetation p-0/s-0 - - -

*Two openings and septum heavily weather eroded. Water flow evident from clay wash.



**SITE CONDITION ASSESSMENT
TSANKAWI MESA
BANDELIER NATIONAL MONUMENT**

Site: Tsankawi (LA50976)

Feature: Cavate

Group\Sector : B

Room\Area: 30

Toll Assessment: Greater Threat

Examined by: Frank Matero/Shawn Provencher
7/2/97

Date:

1.0 STRUCTURAL FEATURE SUMMARY DATA

Feature Type: Cavate

Dimensions and axes:

length: 106in. **width:** 75in.

dia(min): 125in.

dia(max): 150in.

height: 47in.

wall thick(top): 16in.

basal: 17in.

Context: isolated/contiguous/open/sheltered/other:

Exposure/Orientation (facing):

Contained/East

Moisture: wet/dry

Vegetation: none

Plan: circular/ovate/D-shaped/quadrilateral/unknown/other: L-shaped, see diagram.

Section/elevation:

subterranean/semi-subterranean/surface/1-story/2-story/multiple story

*Flat ceiling.



Site: Tsankawi (LA50976)

Feature: Cavate

Group\Sector : C

Room\Area: 30

Toll Assessment: Greater Threat

Examined by: Frank Matero/Shawn Provencher
7/2/97

Date:

2.0 DETAIL DESCRIPTION

Walls: natural rock/stone

Type: red tuff

Wall Features: pilasters/banquette/shelf/niche/ventilator

doorway/wall (2) peg/loop/socket/other: *Five niches, see

diagram.

Surface

Finish:

undressed/simple/fracture/pointed/pecked/rubbed/obscured/other:

3.0 SURFACE FINISHES

Type: paint/plaster: defacto/basecoat/finish coat-single/multiple

No. layers: 2

Application: monochrome/bichrome/floor band/dado/aura/other:

Height Applied: 35in.

Color(s): red/brown/tan/white/grey/black/blue/green/other:

Surface Attributes: fingerprints/striated/sooted/fire-reddened/other:

Rock Art/design:

4.0 DOCUMENTATION:

*Photos taken 7/2/97

p.2



Site: Tsankawi (LA50976)

Feature: Cavate

Group/Sector : C

Room/Area: 30

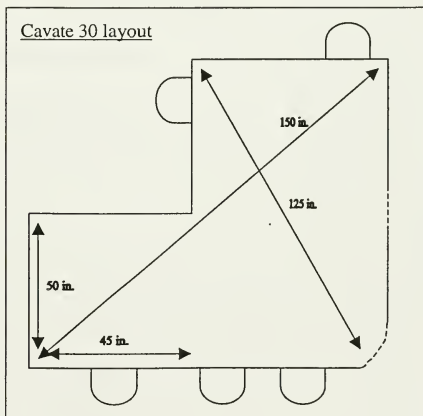
Toll Assessment: Greater Threat

Examined by: Frank Matero/Shawn Provencher

Date: 7/2/97

5.0 STRUCTURAL FEATURE CONDITION

- Due to the complexity of this cavate, a description is used instead of the numerical rating of Structural Feature Conditions.
- The south and west walls are extremely friable and have lost all plaster.
- The north wall of the alcove in good condition with plasters and soot intact.
- The north and east walls of the main chamber is in fair condition with partial plasters and soot.
- The interior of the south (ext.) wall is heavily eroded and there is a loss of greater than 1in. due to water and salts.
- Fifty percent of the ceiling is lost with loss up to 7in. thick. The remaining ceiling is a detached slab 1in. thick.
- The rounded niche retains white plaster.
- The primary damage is the result of poorly compacted fed tuff and severe water penetration through percolation and wind driven rain.



- The cavate retains high structural integrity but is very fragile and unstable.



6.4 Appendix 4- Tsankawi Resources Database Report

This is a database of Tsankawi related materials arranged by source type. It is intended to serve as a foundation database for further research.

ARTICLES

title: Prehistoric Ruins of Tsankawi, The

author Beam, George L.

publication: National Geographic Magazine 20 (1909)

date: 1909

description description

title: Archaeology of the Pajarito Park, New Mexico

author Hewett, Edgar L.

publication: American Anthropologist 6 (1904)

date: 1904

description archaeology, description



BOOKS

title: Final Report of Investigations Among the Indians of the Southwestern United States, Carried on Mainly in the Years 1880 to 1885

publisher Cambridge: John Wiley and Sons.

date: 1892

author Bandelier, Adolph F.

description exploration, description

title: Antiquities of the Jemez Plateau, New Mexico

publisher Washington, D.C.: Smithsonian Institution.

date: 1906

author Hewett, Edgar L.

description archaeology, description

title: Pajarito Plateau and its Ancient People, The

publisher Albuquerque: University of New Mexico Press.

date: 1938

author Hewett, Edgar L.

description archaeology, description

title: Pueblo World Indian World: Studies on the Natural History of the Rio Grande Valley in Relation to Pueblo Indian Culture

publisher Albuquerque: University of New Mexico Press.

date: 1945

author Hewett, Edgar L., and Bertha P. Dutton

description archaeology, ethnography



BOOKS

title: Southwestern Journals of Adolph F. Bandelier, The
publisher Albuquerque: University of New Mexico Press.
date: 1975
author Lange, Charles H., and Carroll L. Riley eds.
description exploration, description

title: Rock Art of Bandelier National Monument, The
publisher Albuquerque: University of New Mexico Press
date: 1989
author Rohn, Arthur H.
description ethnography, description

title: Bandelier National Monument: An Administrative History
publisher Santa Fe: National Park Service
date: 1988
author Rothman, Hal
description history

title: On Rims and Ridges: The Los Alamos Area Since 1880
publisher Lincoln: University of Nebraska Press
date: 1992
author Rothman, Hal
description history



BOOKS

title: An Analysis of Variability and Condition of Cavate Structures in
Bandelier
National Monument

publisher Santa Fe: National Park Service

date: 1995

author Toll, H. Wolcott

description archaeology

title: The Pajarito Plateau: A Bibliography

publisher Santa Fe: National Park Serevice

date: 1993

author Mathien, Francis Joan, Charlie R. Steen, and Craig D. Allen

description bibliography

title: A Guide to Bandelier Monument

publisher Los Alamos: Los Alamos Historical Society

date: 1977

author Hoard, Dorothy

description guide

title: The Tewa World

publisher Chicago: University of Chicago Press

date: 1969

author Ortiz, Alfonso

description anthropology



BOOKS

- title:** Wild Plants of the Pueblo Province
publisher Santa Fe: Museum of New Mexico Press
date: 1995
author Dumire, William and Gail Tierney
description science
- title:** San Juan Pueblo Tewa Dictionary
publisher Portales, New Mexico: Bishop Publishing Company
date: 1982
author Martinez, Esther
description dictionary
- title:** NPS-28: Cultural Resource Management Guideline
publisher Washington, D.C., National Park Service
date: 1994
author National Park Service
description management



GOVERNMENT DOCUMENTS

title: Draft Development Concept Plans, Frijoles Canyon and Tsankawi,
Bandelier
National Monument

author National Park Service

date: 1995

description planning, administration

title: Final Master Plan, Bandelier National Monument

author National Park Service

date: 1977

description planning, administration

title: Interpretive Prospectus, Bandelier National Monument

author National Park Service

date: 1993

description planning, administration

ERROR: ioerror
OFFENDING COMMAND: image_ation Issues-
Tsankawi Mesa, Bandelier National Monument
STACK:
false



PHOTOS

date: 1915

source: Nusbaum, Santa Fe Regional Office

description pueblo panoramic

negative 48511

date: 1915

source: Nusbaum, Santa Fe Regional Office

description pueblo panoramic

negative 48510

date: 1915

source: Nusbaum, Santa Fe Regional Office

description pueblo panoramic

negative 94060

date: 1915

source: Nusbaum, Santa Fe Regional Office

description pueblo panoramic

negative 130505



PHOTOS

date: 0

source: Santa Fe Regional Office

description ruins

negative 31118

date: 1912

source: Nusbaum, Santa Fe Regional Office

description Santiago Naranjo at the top

negative 130502

date: 1917

source: Santa Fe Regional Office

description ruins

negative 28092

date: 1917

source: Santa Fe Regional Office

description trail

negative 8213



PHOTOS

date: 1910

source: Santa Fe Regional Office

description Santiago Naranjjo coming down

negative 130504

date: 0

source: BAE 29th Annual Report, Bandelier archives

description Scene on Saekewii Mesa , showing the old Indian trail, plate 10

negative 01260x

date: 0

source: BAE 29th Annual Report, Bandelier archives

description Scene on Saekewii Mesa , showing the old Indian trail, plate 9

negative 01262x

date: 0

source: Bandelier archives

description crevice from top

negative 01262x



PHOTOS

date: 1910

source: Nusbaum, Santa Fe Regional Office

description crevice from top, Santiago Naranjo coming down

negative 130503

date: 1930

source: Santa Fe Regional Office

description crevice from front

negative 83022

date: 0

source: Bandelier archives

description crevice from front

negative 01262w

date: 1917

source: Santa Fe Regional Office

description crevice from front

negative 8214



PHOTOS

date: 0

source: Bandelier archives

description panel and crevice

negative 01262x

date: 0

source: Bandelier archives

description worn trail

negative 01260x

date: 0

source: Bandelier archives

description former steps at beginning of trail

negative 03497a

date: 0

source: Bandelier archives

description pueblo ruin facing north

negative 03491a



PHOTOS

date: 0

source: Bandelier archives

description pueblo ruin wall, facing south

negative 01240a

date: 0

source: Bandelier archives

description split trail, west end of mesa

negative 01256b

date: 0

source: Bandelier archives

description split trail, west end of mesa

negative 01257a

date: 1938

source: Bandelier archives, Natt N. Dodge

description worn trail

negative 01253a



PHOTOS

date: 1938

source: Bandelier archives

description pueblo ruin

negative 01236w

date: 0

source: Bandelier archives

description worn trail, after switchbacks

negative 01253b

date: 0

source: Bandelier archives

description aerial of mesa

negative 10-183b

date: 1929

source: Museum of New Mexico, Charles Lindberg

description aerial of mesa

negative 130290



SLIDES

date: 1997

source: upenn

description trails, before switchback

slide 1

date: 1997

source: upenn

description trails, cautionsign

slide 2

date: 1997

source: upenn

description trails, cliffedge

slide 3

date: 1997

source: upenn

description trails, crevice above

slide 4

date: 1997

source: upenn

description trails, crevice detail

slide 5



SLIDES

date: 1997

source: upenn

description trails, crevice front

slide 6

date: 1997

source: upenn

description trails, crevice with figure

slide 7

date: 1997

source: upenn

description trails, downslope

slide 8

date: 1997

source: upenn

description trails, dual trail contemporary

slide 9

date: 1997

source: upenn

description trails, gate

slide 10



SLIDES

date: 1997

source: upenn

description trails, inside gate

slide 11

date: 1997

source: upenn

description trails, ladder 2 down

slide 12

date: 1997

source: upenn

description trails, ledge trail

slide 13

date: 1997

source: upenn

description trails, ledge trail 2

slide 14

date: 1997

source: upenn

description trails, ledge trail wash

slide 15



SLIDES

date: 1997

source: upenn

description trails, loop trail sign

slide 16

date: 1997

source: upenn

description trails, loop trail sign 2

slide 17

date: 1997

source: upenn

description trails, many trails

slide 18

date: 1997

source: upenn

description trails, marker 13

slide 19

date: 1997

source: upenn

description trails, marker 13-2

slide 20



SLIDES

date: 1997

source: upenn

description trails, marker 3

slide 21

date: 1997

source: upenn

description trails, marker 4

slide 22

date: 1997

source: upenn

description trails, past ladder

slide 23

date: 1997

source: upenn

description trails, paved at start, toilets

slide 24

date: 1997

source: upenn

description trails, paved trail

slide 25



SLIDES

date: 1997

source: upenn

description trails, paved trail washout

slide 26

date: 1997

source: upenn

description trails, paved trail washout 2

slide 27

date: 1997

source: upenn

description trails, red tuff entry

slide 28

date: 1997

source: upenn

description trails, severe wear, ladder 2

slide 29

date: 1997

source: upenn

description trails, south cliff edge

slide 30



SLIDES

date: 1997

source: upenn

description trails, south face 1

slide 31

date: 1997

source: upenn

description trails, south side

slide 32

date: 1997

source: upenn

description trails, south side detail

slide 33

date: 1997

source: upenn

description trails, south side detail 2

slide 34

date: 1997

source: upenn

description trails, switchback

slide 35



SLIDES

date: 1997

source: upenn

description trails, three ruts

slide 36

date: 1997

source: upenn

description trails, tuff wear

slide 37

date: 1997

source: upenn

description trails, wavy trail

slide 38

date: 1997

source: upenn

description trails, wear before switchback

slide 39

date: 1997

source: upenn

description trails, west trail

slide 40



SLIDES

date: 1997

source: upenn

description trails, worn trail

slide 41

date: 1997

source: upenn

description panoramic, 1

slide 42

date: 1997

source: upenn

description panoramic, 2

slide 43

date: 1997

source: upenn

description panoramic, 3

slide 44

date: 1997

source: upenn

description panoramic, 4

slide 45



SLIDES

date: 1997

source: upenn

description panoramic, 5

slide 46

date: 1997

source: upenn

description panoramic, 6

slide 47

date: 1997

source: upenn

description panoramic, 7

slide 48

date: 1997

source: upenn

description panoramic, 8

slide 49

date: 1997

source: upenn

description panoramic, 9

slide 50



SLIDES

date: 1997

source: upenn

description miscellaneous, stone circle

slide 51

date: 1997

source: upenn

description miscellaneous, stone figure

slide 52

date: 1997

source: upenn

description miscellaneous, stone ladder

slide 53

date: 1997

source: upenn

description miscellaneous, west mesa from parking lot

slide 54

date: 1997

source: upenn

description miscellaneous, parking lot

slide 55



SLIDES

date: 1997

source: upenn

description miscellaneous, potsherds

slide 56

date: 1997

source: upenn

description miscellaneous, trailhead sign

slide 57

date: 1997

source: upenn

description miscellaneous, view north from mesa

slide 58

date: 1997

source: upenn

description miscellaneous, visitor's center

slide 59

date: 1997

source: upenn

description cavate interior, group c, room 30, big niche

slide 60



SLIDES

date: 1997

source: upenn

description cavate interior, group c, room 30, ceiling delam

slide 61

date: 1997

source: upenn

description cavate interior, group c, room 30, friable niche

slide 62

date: 1997

source: upenn

description cavate interior, group c, room 30, corner

slide 63

date: 1997

source: upenn

description cavate interior, group c, room 30, heavy friable

slide 64

date: 1997

source: upenn

description cavate interior, group c, room 30, entry

slide 65



SLIDES

date: 1997

source: upenn

description cavate interior, group c, room 59, niches/serpent

slide 66

date: 1997

source: upenn

description cavate interior, group c, room 59, dado/petroglyph

slide 67

date: 1997

source: upenn

description cavate interior, group c, room 59, petroglyph

slide 68

date: 1997

source: upenn

description cavate interior, group c, room 59, entry erosion

slide 69

date: 1997

source: upenn

description cavate interior, group c, room 59, entry exterior

slide 70



SLIDES

date: 1997

source: upenn

description cavate interior, group c, room 59, fire pit

slide 71

date: 1997

source: upenn

description cavate interior, group c, room 59, mask petroglyph

slide 72

date: 1997

source: upenn

description cavate interior, group c, room 59, corner dado

slide 73

date: 1997

source: upenn

description cavate interior, group c, room 59, plaster detach

slide 74

date: 1997

source: upenn

description cavate interior, group c, room 59, salts

slide 75



SLIDES

date: 1997

source: upenn

description cavate interior, group c, room 59, entry exterior

slide 76

date: 1997

source: upenn

description south cavate view, view west

slide 77

date: 1997

source: upenn

description south cavate view, view east

slide 78

date: 1997

source: upenn

description south cavate view, south side

slide 79

date: 1997

source: upenn/Bandelier archives

description archive photo, Hewett pueblo drawing

slide 80



SLIDES

date: 1997

source: upenn

description pueblo ruin, general view east

slide 81

date: 1997

source: upenn

description pueblo ruin, kiva 1

slide 82

date: 1997

source: upenn

description pueblo ruin, kiva 2

slide 83

date: 1997

source: upenn

description pueblo ruin, kiva 3-detail

slide 84

date: 1997

source: upenn

description pueblo ruin, northwall

slide 85



SLIDES

date: 1997

source: upenn

description pueblo ruin, behind sign

slide 86

date: 1997

source: upenn

description pueblo ruin, sign

slide 87

date: 1997

source: upenn

description pueblo ruin, south east social trail

slide 88

date: 1997

source: upenn

description pueblo ruin, southwalls

slide 89

date: 1997

source: upenn

description pueblo ruin, south with wall

slide 90



SLIDES

date: 1997

source: upenn

description pueblo ruin, top with north mesa

slide 91

date: 1997

source: upenn

description north mesa, cavate

slide 92

date: 1997

source: upenn

description north mesa, slide

slide 93

date: 1997

source: upenn

description north mesa, view of tsankawi

slide 94

date: 1997

source: upenn

description panel, south panel

slide 95



SLIDES

date: 1997

source: upenn

description panel, panel 6

slide 96

date: 1997

source: upenn

description panel, panel 5 detail

slide 97

date: 1997

source: upenn

description panel, panel 4

slide 98

date: 1997

source: upenn

description panel, panel 3

slide 99

date: 1997

source: upenn

description panel, panel 2 detail

slide 100



SLIDES

date: 1997

source: upenn

description panel, panel 2

slide 101

date: 1997

source: upenn

description panel, panel 1

slide 102



UNPUBLISHED SOURCES

title: The Non-Founding of a National Park: The Pajarito Park Proposal,
1900-1920

author Altherr, Thomas L.

date: 1985

location: Bandelier National Monument Archives

description history

title: Archaeological Assessment of Bandelier National Monument

author Bousman, C. Britt, Paul Larson, and Frances Levine

date: 1974

location: Bandelier National Monument Archives

description archaeology

title: Bandelier National Monument: Part II of Report by Herbert W. Gleason
for the
Summer of 1919, The

author Gleason, Herbert W.

date: 1919

location: Bandelier National Monument Archives

description planning, description

title: Proposed Park of the Cliff Cities: Part III of Report by Herbert W.
Gleason for
the Summer of 1919

author Gleason, Herbert W.

date: 1919

location: Bandelier National Monument Archives



description planning, description



UNPUBLISHED SOURCES

title: Report on the Excavation of a Child's Burial in Cave Room C54,
Tsankawi
Ruin, Bandelier National Monument

author Johnson, Chester

date: 1960

location: Bandelier National Monument Archives

description archaeology

title: Stabilization of Cave Ruins, Bandelier National Monument

author Lister, Robert H.

date: 1940

location: Bandelier National Monument Archives

description archaeology, preservation

title: Cave Kiva in Bandelier National Monument, A

author Maxon, James

date: 1962

location: National Park Service Southwest Office Archives

description archaeology

title: Area Management Study, Bandelier National Monument

author National Park Service

date: 1956

location: Bandelier National Monument Library

description planning



UNPUBLISHED SOURCES

- title:** Mission 66 for Bandelier National Monument
author National Park Service
date: 1957
location: Bandelier National Monument Library
description planning
- title:** Proposed Valle Grande -Bandelier National Park, New Mexico, A
author National Park Service
date: 1964
location: National Park Service Southwest Office Library
description planning
- title:** Report on Proposed Jemez Crater National Park, New Mexico
author National Park Service
date: 1939
location: Bandelier National Monument Archives
description planning
- title:** Report on the Bandelier National Monument and Proposed Cliff Cities
National
Park
author Nussbaum, Jesse L., M.R. Tillotson, and Roger Toll
date: 1930
location: Bandelier National Monument Archives
description planning, description



7.0 INDEX

- abrasion, 10, 37, 39, 41, 44, 45, 52
- Antiquities Act, 18
- Arcview, 27, 78, 79
- Bandelier, Adolph, 5, 12, 27
- Bandelier National Monument, 1, 2, 4, 6, 7, 15, 17, 18, 26, 33, 50, 58, 59, 76, 78, 103, 106, 107, 136, 137, 138, 139, 140, 142, 143, 145, 146, 147, 148
- burials, 48, 71
- Burra Charter, 1, 2, 74, 143
- cavates, ii, 5, 8, 9, 10, 11, 15, 19, 20, 27, 30, 32, 33, 36, 44, 45, 46, 49, 50, 51, 52, 53, 67, 72, 77, 79, 81, 99, 100, 126, 127, 128, 129, 130, 133, 148
- circulation, 7, 9, 38, 56, 62, 68
- climate, 30
- Compatible Trail Fill, 75
- consolidation, 74
- cosmology, 1, 20, 25
- cultural landscape, 2, 5, 6, 7, 8, 9, 17, 18, 25, 56, 58, 78
- Cultural Landscape Inventory, 8
- Cultural Resources Management Guideline, 1
- deterioration, 7, 10, 33, 36, 53, 55, 56, 58, 60, 62, 67, 72, 74
- ecology, 1
- efflorescence, 10, 53
- Ellis, Florence, 16, 17, 144
- erosion, 8, 9, 10, 34, 36, 38, 41, 47, 53, 62, 72, 128
- Ethnogeography, ii, 19, 21, 144
- Ethnography, ii, 1, 9, 27, 145
- Ferguson, William, 27
- fins, 38, 44, 73
- Frijoles Canyon, 4, 50, 59, 64, 106
- Geology, ii, 28
- GIS, 27, 78, 79
- Hewett, Edgar Lee 12, 13, 16, 27



hydrology, 10, 62, 72, 77

infiltration, 10, 53

interpretation, 2, 17, 19, 55, 60, 61, 62, 64, 65, 66, 77

Johnson, Darryll R., 15, 60, 66, 138, 143, 144, 145, 149

kivas, 12, 14, 47, 50, 62, 70

landscape, 2, 8, 9, 16, 17, 20, 22, 24, 25, 35, 55, 63, 75, 76

Lister, 15, 107, 138

Los Alamos National Laboratory, 4, 107, 145

maintenance, 7, 62, 75

management, 1, 2, 6, 9, 11, 17, 18, 19, 20, 25, 38, 55, 56, 57, 58, 62, 64, 76, 78, 105

Mera, H.P., 14, 146

Methodolgy, 26

Mindeleff, Cosmos, 49, 146

National Park Service, 2, 6, 7, 8, 9, 16, 17, 18, 19, 20, 25, 26, 55, 56, 57, 60, 103,
104, 105, 106, 107, 138, 140, 142, 144, 146, 147, 148, 149

noncompliance, 60, 64

North Mesa, 5, 23, 25

NPS-28, 1, 2, 3, 7, 55, 56, 105, 148

official presence, 58, 59, 64, 65

Ortiz, 20, 21, 24, 27, 104

Pajarito Plateau, 13, 16, 24, 28, 29, 30, 31, 32, 48, 49, 102, 104, 146, 147, 148

petroglyphs, ii, 5, 9, 11, 19, 20, 24, 39, 40, 44, 51, 68, 77, 76, 128, 129

photographs, 26, 27, 36, 40

plaster, 9, 32, 51, 52, 53, 85, 87, 91, 98, 99, 100, 129

potsherds, 19, 43, 126

Powers, Robert, 16, 28, 147

pueblo, 5, 6, 9, 11, 12, 13, 14, 16, 19, 20, 22, 23, 24, 30, 32, 41, 42, 47, 48, 50, 55, 56,
61, 66, 67, 69, 70, 71, 78, 79, 73, 108, 112, 113, 114, 130, 131, 132, 133

Pueblo Revolt, 50

recommendations, 63, 68, 76



Resources Management Plan, 6, 18, 143

Rohn, Arthur, 28, 77, 103, 147

ruin, 5, 11, 16, 20, 32, 41, 42, 43, 47, 48, 61, 66, 67, 69, 70, 78, 112, 113, 114, 131,
132, 133

San Ildefonso 4, 9, 16, 17, 19, 21, 22, 23, 25, 27, 55, 62, 64, 65, 70, 144, 149

Sandia Canyon, 5, 22

secondary trails, 16, 26, 42, 43, 44, 45, 48, 52, 68, 69

shrines, 9, 11, 22, 23, 25, 68, 70

signage, 34, 58, 59, 61, 66

tertiary trails, 42, 43, 45, 68

Tewa, 2, 5, 8, 9, 11, 16, 17, 20, 21, 22, 23, 24, 25, 27, 31, 32, 104, 105, 144, 146, 147

Toll, Wolcott, 15, 16, 28, 30, 49, 50, 51, 53, 54, 77, 81, 82, 84, 86, 88, 90, 92, 95, 97,
99, 104, 140, 148

traditional use, 6

trails, 5, 8, 9, 10, 11, 20, 27, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44,
45, 46, 47, 48, 52, 55, 56, 57, 58, 59, 61, 63, 67, 68, 69, 70, 71, 72, 73, 75, 77, 78,
109, 110, 112, 113, 114, 115, 116, 117, 118, 119, 120, 122, 123, 132

Trail Coercion, 68

Tsankawi Mesa, 1, ii, 4, 8, 19, 47

tuff, 5, 11, 28, 29, 30, 36, 37, 38, 40, 41, 44, 45, 46, 48, 49, 51, 52, 53, 61, 62, 71, 73,
74, 75, 76, 74, 85, 91, 98, 100, 120, 122

vegetation, ii, 8, 9, 10, 19, 25, 31, 33, 34, 35, 37, 39, 41, 42, 47, 48, 62, 63, 67, 68, 72,
82, 87, 88, 93, 95

visitors, 10, 25, 33, 34, 37, 39, 40, 41, 43, 44, 52, 57, 59, 60, 61, 62, 67, 68, 72, 86,
92, 144, 145, 149

Anne & Jerome Fisher

FINE ARTS LIBRARY

University of Pennsylvania

Please return this book as soon as you have finished with it. It must be returned by the latest date stamped below.



FISHER
FINE ARTS LIBRARY

FEB 26 1999

UNIV. OF PENNA.

3 1198 02418 2565



N/1198/02418/2565X

3 1198 02418 2565



N/1198/02418/2565X

ST