general management plan
wilderness suitability study

El Malpais National Monument
New Mexico

general management plan
wilderness suitability study

october 1990

EL MALPAIS NATIONAL MONUMENT • NEW MEXICO

UNITED STATES DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE

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EL MALPAIS NATIONAL MONUMENT

U.S. DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE

DSC/JULY 1989/103/20,003

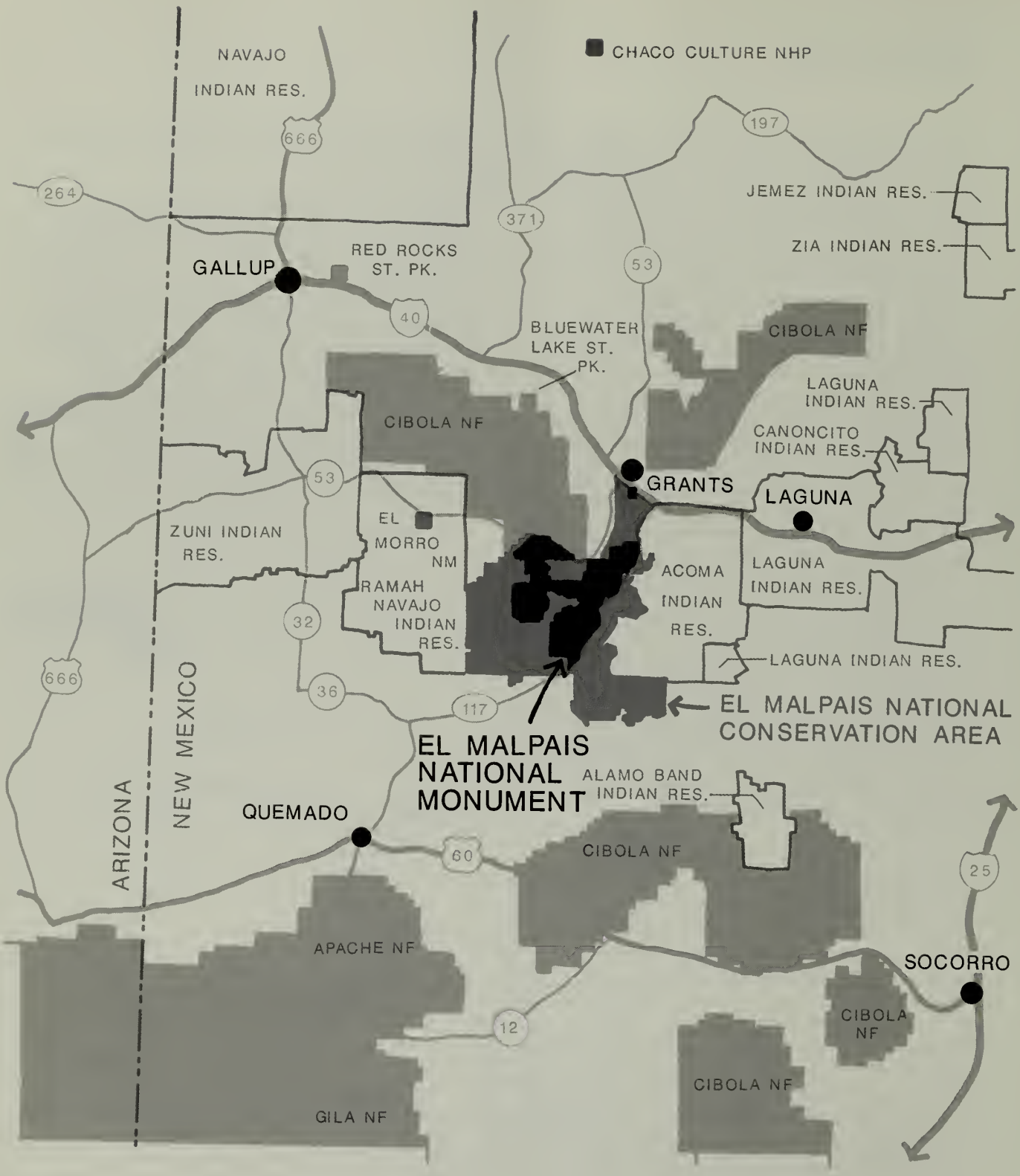
INTRODUCTION

As of December 31, 1987, El Malpais National Monument is a newly established area of the national park system (see Region, Vicinity, and Existing Conditions maps). As the following maps show, El Malpais National Monument/National Conservation Area is in northwestern New Mexico. Grants, New Mexico, on Interstate 40 (I-40), is at the northern edge of the monument. The approximately 114,848-acre monument, entirely within Cibola County, is bounded on the east by State Highway 117 (NM 117) and on the northwest by NM 53. Most of the national monument is surrounded by El Malpais National Conservation Area. Mostly volcanic terrain, the monument includes some of the most recent lava flows in the continental United States. "El Malpais" means "bad lands." This rugged area contains fragile biotic resources and many ice caves, lava tubes, kipukas (isolated islands of older rock and vegetation surrounded by lava flows), spattercones, lava tree casts, and other interesting volcanic features. There are also numerous archeological sites and other cultural resources, which comprise a record of human occupation that extends from the distant past to the present and marks occupation by several prehistoric and contemporary Indian cultures. The lava tubes, ice caves, and unusual plant associations, and the human culture, history, and prehistory, all merge in a rich mosaic in El Malpais.

El Malpais is much more than an economic, scientific, and recreational resource, as recognized in the special provisions of the legislation that authorized the national monument and national conservation area. The McCartys flow and other lands are a vast cultural landscape, with deep special meaning to the American Indians in the area, especially the Acoma, Laguna, Ramah Navajo, and Zuni tribes. During planning, Indian interests, including religion, were frequently considered; it was quite apparent that El Malpais and the American Indian people who have occupied and used it for millennia are closely intertwined. The planning team for this plan has made a concerted effort to understand this and plan in a way that will help visitors understand this special aspect of El Malpais.

This general management plan establishes and guides the overall management, development, and use of the monument for approximately the next 15 years. The primary focus is to protect and preserve the natural and cultural environments; to permit biological, geological, and other natural processes to continue with a minimum of human intervention; to provide opportunities for enjoyable visitor experiences as well as an understanding of the significance of monument resources; and to consult with American Indians on matters of access, development, interpretation, and protection of resources.[1]

1. The establishing legislation and the legislative and other issues that guided the planning process appear in appendixes A and B, respectively.



VICINITY

EL MALPAIS NATIONAL MONUMENT

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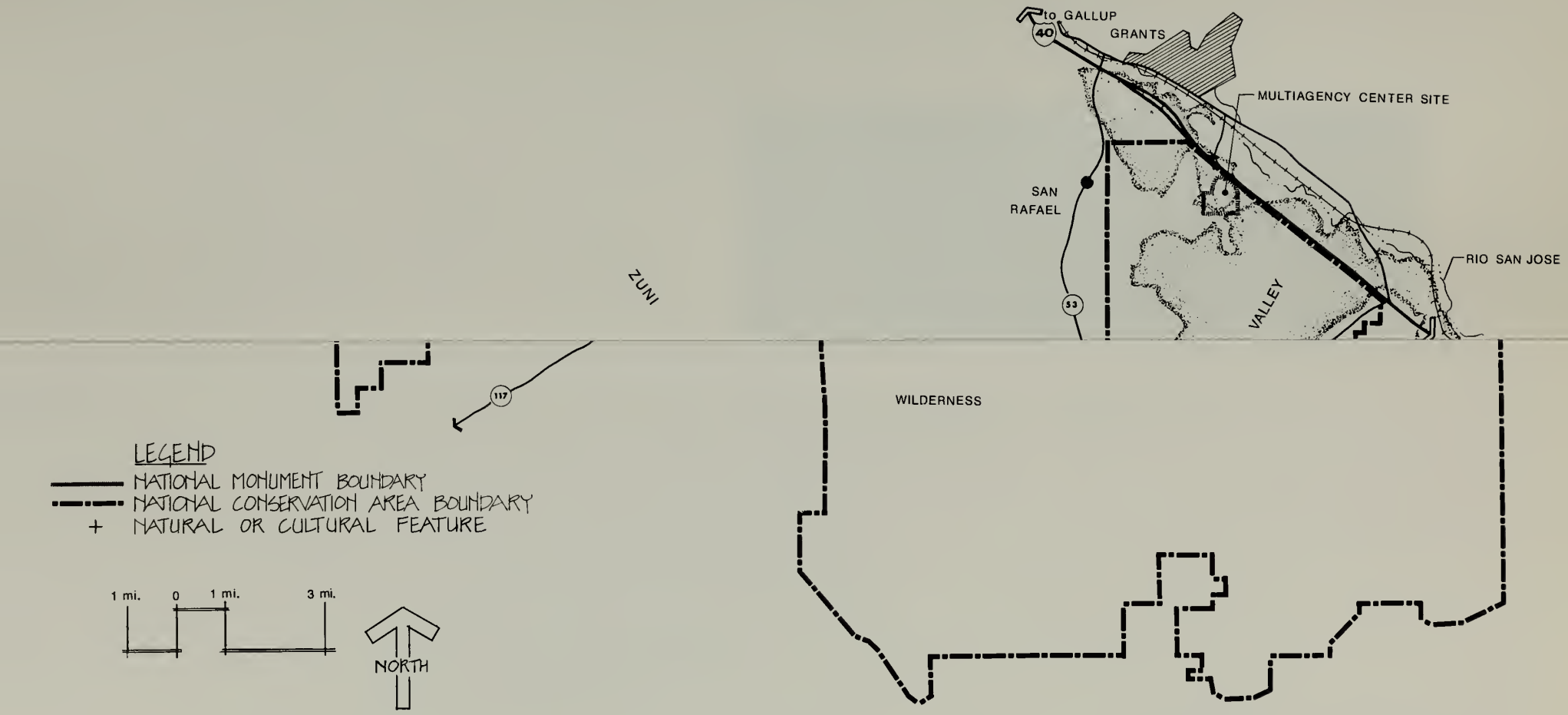

EXISTING CONDITIONS

EL MALPAIS NATIONAL MONUMENT

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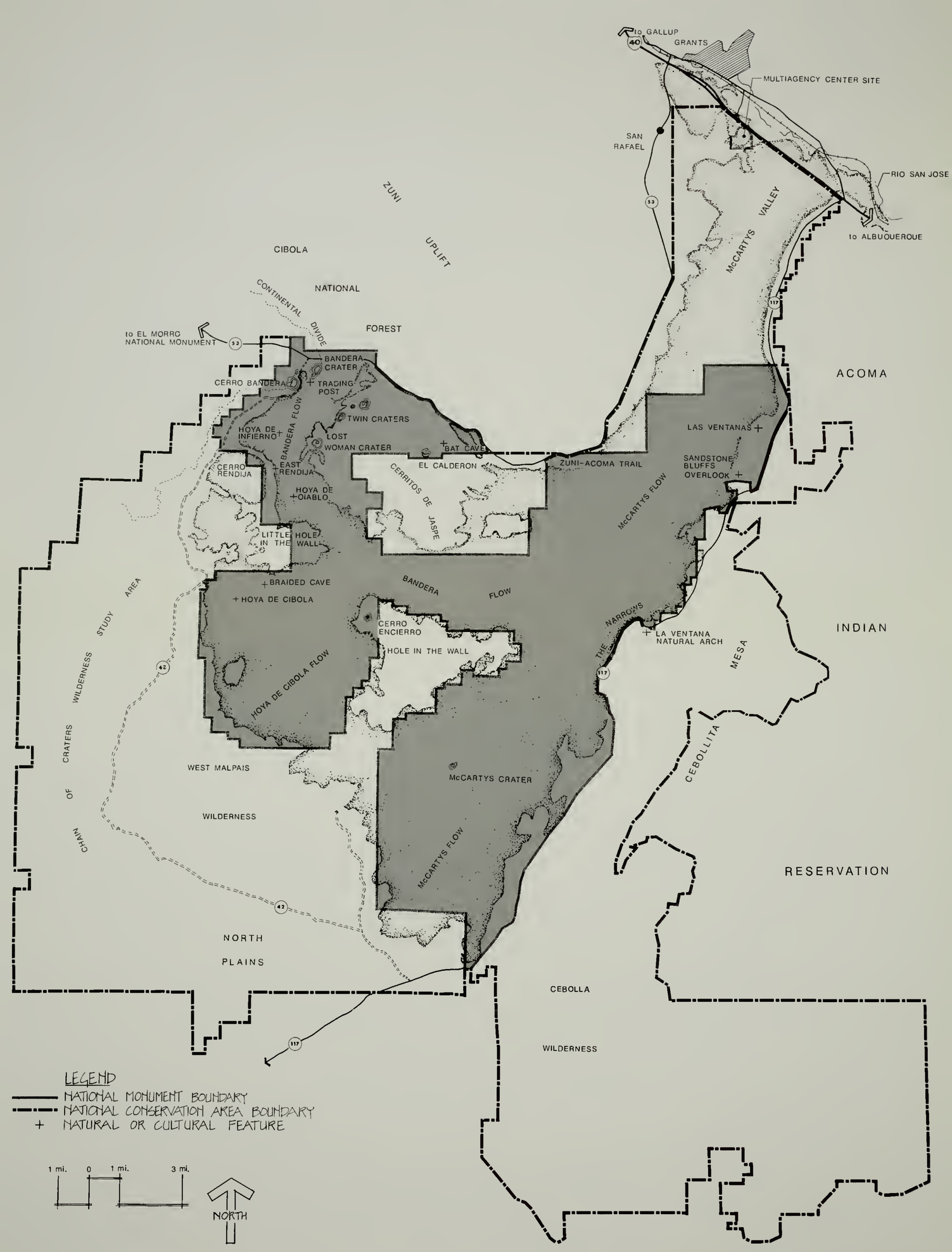


LEGEND

NATIONAL MONUMENT BOUNDARY

NATIONAL CONSERVATION AREA BOUNDARY

\+ NATURAL OR CULTURAL FEATURE

1 mi. 0 1 mi. 3 mi.

NORTH

EXISTING CONDITIONS

EL MALPAIS NATIONAL MONUMENT

U.S. DEPARTMENT OF THE INTERIOR/NATIONAL PARK SERVICE

DSC/JULY 1990/103/20,005A

THE PLAN

THE PLAN

INTRODUCTION

Background

Because El Malpais is a new national monument and has very little infrastructure for supporting visitor services and management, it is important that the plan effectively addresses the development needs while ensuring a high level of protection for the resources, including those important to American Indians. A summary of the plan is presented on the General Development map (and in the table at the end of this section).

The natural and cultural resources management plan sections, included later, are integral parts of this general management plan, as are the visitor use/facility development and visitor services plans.

The plan will take about 15 years to implement, and the various steps needed for implementation have been prioritized. Comprehensive design for facilities and surveys for archeological, ethnographic, and natural resources will be completed before any actions are undertaken; depending on survey results, details of the general management plan will be modified, as necessary, to mitigate adverse effects on these resources.

This NPS *General Management Plan/Wilderness Suitability Study* meets the statutory proposals for visitor centers at Grants and Bandera Crater and recommends additional development, including facilities necessary for visitors to see representative monument resources without infringing on American Indian interests. The document also provides the necessary initial protection of the cultural and natural resources for this new unit of the national park system, including identification of areas suitable as wilderness. The impacts of implementing the plan can be found in the *Draft General Management Plan/Environmental Assessment/Wilderness Suitablity Study* and will not be repeated in this final plan.

Following the review period on the draft plan, written and verbal comments from the public were assessed by the planning team and incorporated into this final plan. A summary of public input on the draft plan and wilderness suitability study is in the "Summary of Public Involvement" section.

Cooperative Planning

A key aspect of planning for El Malpais has involved cooperative planning – with the Bureau of Land Management, with American Indian groups, and with other interested organizations (the city of Grants, the Grants Chamber of Commerce, the Cibola Convention and Visitors Bureau, etc.). This summary of cooperative planning is presented to show how common issues were addressed during the planning process.

During planning, NPS and BLM teams met several times and reviewed the significance of the national monument and the national conservation area. A list of interpretive objectives that guided preparation of the alternatives for visitor use (access and interpretation) was compiled by the two teams.[2] The teams met to ensure that these alternatives would not be in conflict and would serve the overall visitor experiences of the national monument and the national conservation area.

Cooperative planning for the multiagency center at Grants involved group workshops, which aimed at defining the objectives of that proposed facility. Planning included the NPS and BLM teams and also representatives of the Forest Service, the New Mexico Departments of Tourism and Natural Resources, the city of Grants, the Grants Chamber of Commerce, the Cibola Convention and Visitors Bureau, and the Pueblo of Acoma. Important guidance as to the geographic scope and the character of informational services and media resulted from these workshops.

Visitor use of the NM 117 corridor was of particular concern because of the important features in this

2. These objectives can be found in the introduction to the "Visitor Services/Interpretation Plan" section of this document.

area, the mutual NPS/BLM boundary along most of the corridor, and the concerns of the American Indians about sites of religious significance and other uses of adjacent tribal lands. NPS and BLM planners agreed not to provide trail access onto the lava area at the Big South Narrows picnic area. They also agreed that different aspects of the prehistoric story warranted public access to both Las Ventanas in the national monument and the Dittert site in the national conservation area. The two teams recommended a bi-agency information kiosk at the south end of the NM 117 corridor. The Park Service provided consultation in trail planning at La Ventana arch.

NPS design and engineering specialists consulted with the BLM planning team on their site alternatives for a ranger station in the NM 117 corridor. Potential water supply and limitations imposed by soils, floodplains, and highway access entered into the evaluation. The BLM planning process led to selection of a site east of NM 117, about 9 miles south of Interstate 40. This station is being built and will be staffed by BLM personnel; it will contain space for a resident ranger who will patrol and respond to emergencies in this part of El Malpais. By cooperative agreement, this facility also will distribute information on the national monument and assist the Park Service in monitoring use in adjacent parts of the monument, including the Sandstone Bluffs and Las Ventanas area where archeological and ethnographic resources need to be protected.

Planners of both agencies consulted with authorities from concerned Indian tribes about areas that should be avoided because of their religious significance.

The results of these joint planning efforts for visitor use can be seen on the General Development map, which shows the distribution of visitor support developments of the two agencies along NM 117 (BLM proposals are in lighter type face). The text following the map details access and visitor use at the NPS areas and summarizes BLM proposals. Details of BLM proposals can be found in the BLM's final general management plan.

Early in the planning, the Bureau of Land Management transferred their existing resource data on the national monument to the Park Service. The Bureau of Land Management also developed a geographic information system for the national monument and the national conservation area, including elevation, topography, slope, aspect, drainage, soil, and vegetation. This has led to identification of the biophysical land units in both areas, and in the future the two agencies will be able to formulate interrelated resource plans that address fire management, models for archeological research and protection, and other topics.

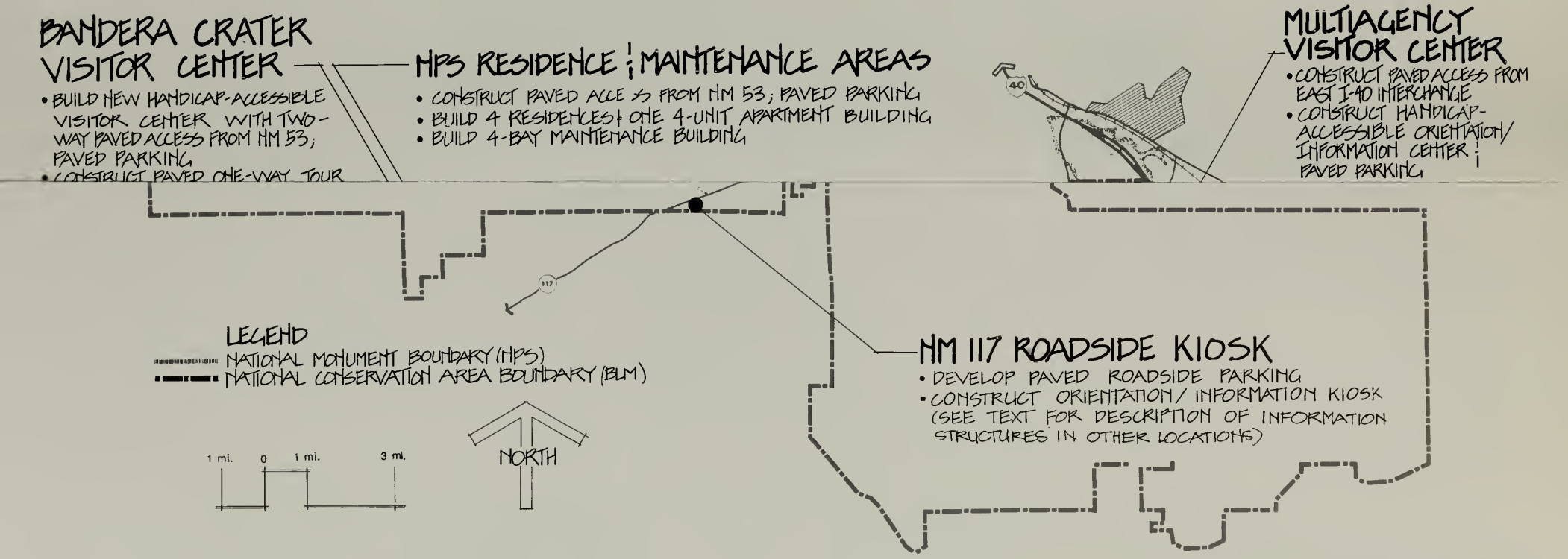
During planning, the Park Service and the Bureau of Land Management divided some tasks of cultural resource evaluation. Historic themes and resources were compiled by consultants to the NPS team, and the ethnographic overview – leading to a synthesis of existing data – was undertaken under contract by the Bureau of Land Management. (Future ethnographic studies will include the detailed information required by NPS policy and will be coordinated between the agencies to cover both the national monument and the national conservation area.)

MANAGEMENT ZONING

The Zones

For NPS management purposes El Malpais National Monument is divided into three zones: natural/cultural, monument development, and special use (see Management Zoning map). These zones have been further divided into a number of subzones. This land classification framework provides essential guidance for monument development and administration and ensures a broad range of recreational experiences.

The **natural/cultural zone** will be managed to conserve the natural resources and processes of the monument, and to preserve, protect, and interpret its cultural resources (prehistoric and historic). Ethnographic resources, including sites of religious and subsistence importance to American Indians, will be protected. As per legal requirements, American Indian access to these sites and privacy for their religious observances will be ensured. Public uses that are allowed within this zone will be those that do not adversely affect the resources and natural processes. The natural/cultural zone is further divided into the **primitive** and **semi-primitive subzones** to ensure a variety of visitor experiences. The primitive subzone will be oriented toward visitors who prefer a remote wilderness-like experience (primarily backcountry



GENERAL DEVELOPMENT

EL MALPAIS NATIONAL MONUMENT

U.S. DEPARTMENT OF THE INTERIOR/NATIONAL PARK SERVICE

DSC/JULY 1990/103/20,007B

BANDERA CRATER VISITOR CENTER

- BUILD NEW HANDICAP-ACCESSIBLE VISITOR CENTER WITH TWO-WAY PAVED ACCESS FROM NM 53; PAVED PARKING.
- CONSTRUCT PAVED ONE-WAY TOUR ROAD FROM VISITOR CENTER TO TRADING POST PARKING AREA; CONTINUE ROAD TO NM 53
- CONSTRUCT PAVED PARKING FOR DRIPPING LAVA CAVE; DEVELOP TRAILHEAD; TRAILS TO DRIPPING LAVA CAVE (PROVIDE STAIR ACCESS); LAVA CRATER
- DEVELOP INTERCONNECTING TRAIL SYSTEM TO LAVA FLOW MARGIN, SANDSTONE RIDGE, TRADING POST; SPATTERCONE VALLEY. DEVELOP UTILITY SYSTEM FOR VISITOR CENTER, MAINT./RES. AREAS; TRADING POST

NPS RESIDENCE; MAINTENANCE AREAS

- CONSTRUCT PAVED ACCESS FROM NM 53; PAVED PARKING
- BUILD 4 RESIDENCES; ONE 4-UNIT APARTMENT BUILDING
- BUILD 4-BAY MAINTENANCE BUILDING

EL CALDERON AREA

- GRAVEL EXISTING ROAD TO JUNCTION CAVE; CONSTRUCT NEW GRAVEL ROAD TO NEW PARKING AREA ¼ MILE FROM BAT CAVE; PROVIDE VAULT TOILETS
- DEVELOP TRAILS TO BAT CAVE; DOUBLE SINKS FROM PARKING AREA; CLOSE EAST SIDE OF BAT CAVE; ALLOW VIEWING
- CLOSE CORRAL ROAD AFTER IMPROVEMENTS MADE ON EL CALDERON ROAD; MARK JUNCTION CAVE TRAIL AND EXTEND TO DOUBLE SINKS; PARKING

ZUNI-ACOMA TRAIL

- USE; REDESIGN EXISTING PARKING
- MAKE TRAIL TO VIEWPOINT WHEELCHAIR-ACCESSIBLE

TRADING POST

- REHABILITATE CONTRIBUTING HISTORIC STRUCTURES FOR ADAPTIVE USE; REMOVE NONCONTRIBUTING STRUCTURES; REDESIGN PARKING
- DEVELOP TRAILS TO SPATTERCONE VALLEY; CERRO BANDERA TRAILHEAD
- PROVIDE PICNIC TABLES (AT LEAST ONE SITE WHEELCHAIR-ACCESSIBLE) NEAR TRADING POST
- MAKE TRAIL TO ICE CAVE; LAVA SURFACE FEATURES WHEELCHAIR-ACCESSIBLE; PROVIDE STAIRS; PLATFORM AT ICE CAVE

ROUTE 42

- REALIGN FIRST 2 MILES FROM NM 53; GRAVEL; ELEVATE ROAD PRISM FROM NM 53 TO EAST RENDIJA TRAILHEAD
- CLOSE; REVEGETATE FIRST 2 MILES OF EXISTING ALIGNMENT
- DEVELOP SPUR ROAD, PARKING, TRAILHEAD; TRAIL TO SUMMIT OF CERRO BANDERA

EAST RENDIJA AREA

- PROVIDE 6-SITE PRIMITIVE CAMPGROUND WITH VAULT TOILETS
- FORMALIZE; GRAVEL PARKING; PROVIDE VAULT TOILETS FOR CAVE AREA TRAILHEAD
- DEVELOP TRAILS TO BIG SKYLIGHT; FOUR WINDOWS CAVES
- MARK ROUTES TO SEVEN BRIDGES; CATERPILLAR COLLAPSES
- CONSTRUCT GRAVEL ROADSIDE PARKING; LOOP TRAIL NEAR THE LAVA WALL

BRAIDED CAVE

- USE EXISTING, UNIMPROVED DIRT PARKING AREA
- MARK ROUTE TO BRAIDED CAVE

MULTIAGENCY VISITOR CENTER

- CONSTRUCT PAVED ACCESS FROM EAST I-40 INTERCHANGE
- CONSTRUCT HANDICAP-ACCESSIBLE ORIENTATION/INFORMATION CENTER; PAVED PARKING
- DEVELOP SHORT TRAIL

LAS VENTANAS

- CONSTRUCT PAVED SPUR ROAD OFF SANDSTONE BLUFFS ROAD
- DEVELOP TRAILHEAD; TRAIL TO NATURAL ARCH, VIEWPOINTS, ROOM BLOCK, TOWER; GREAT KIVAS
- DETERMINE METHOD OF INTERPRETING TOWER KIVA

RANGER STATION (BLM)

- BUILD STATION, PAVED ACCESS, PARKING, RESIDENCE
- DEVELOP INTERPRETIVE TRAIL

SANDSTONE BLUFFS

- REALIGN; PAVE EXISTING ROAD
- REDESIGN; PAVE EXISTING PARKING
- PROVIDE WHEELCHAIR-ACCESSIBLE VAULT TOILETS; ACCESS TO OVERLOOKS
- INSTALL LOCKABLE GATE FOR OVERNIGHT CLOSURE NEAR NM 117

ACOMA-ZUNI TRAIL

- CONSTRUCT PARKING; TRAILHEAD

LA VENTANA (BLM)

- CONSTRUCT GRAVEL PARKING AREA, DEVELOP TRAILHEAD; LOOP TRAIL TO ARCH; WHEELCHAIR-ACCESSIBLE SPUR TO VIEWPOINT
- PROVIDE VAULT TOILETS

THE NARROWS

- CONSTRUCT PARKING
- DEVELOP TRAIL TO LAVA SURFACE FEATURES

SOUTH BIG NARROWS (BLM)

- REDESIGN; GRAVEL ACCESS; PARKING
- PROVIDE PICNIC AREA
- DEVELOP TRAILHEAD FOR CEBOLLA WILDERNESS

NM 117 ROADSIDE KIOSK

- DEVELOP PAVED ROADSIDE PARKING
- CONSTRUCT ORIENTATION/INFORMATION KIOSK (SEE TEXT FOR DESCRIPTION OF INFORMATION STRUCTURES IN OTHER LOCATIONS)

LEGEND

- NATIONAL MONUMENT BOUNDARY (NPS)
- NATIONAL CONSERVATION AREA BOUNDARY (BLM)

1 mi. 0 1 mi. 3 mi.

NORTH

GENERAL DEVELOPMENT

EL MALPAIS NATIONAL MONUMENT
U.S. DEPARTMENT OF THE INTERIOR/NATIONAL PARK SERVICE

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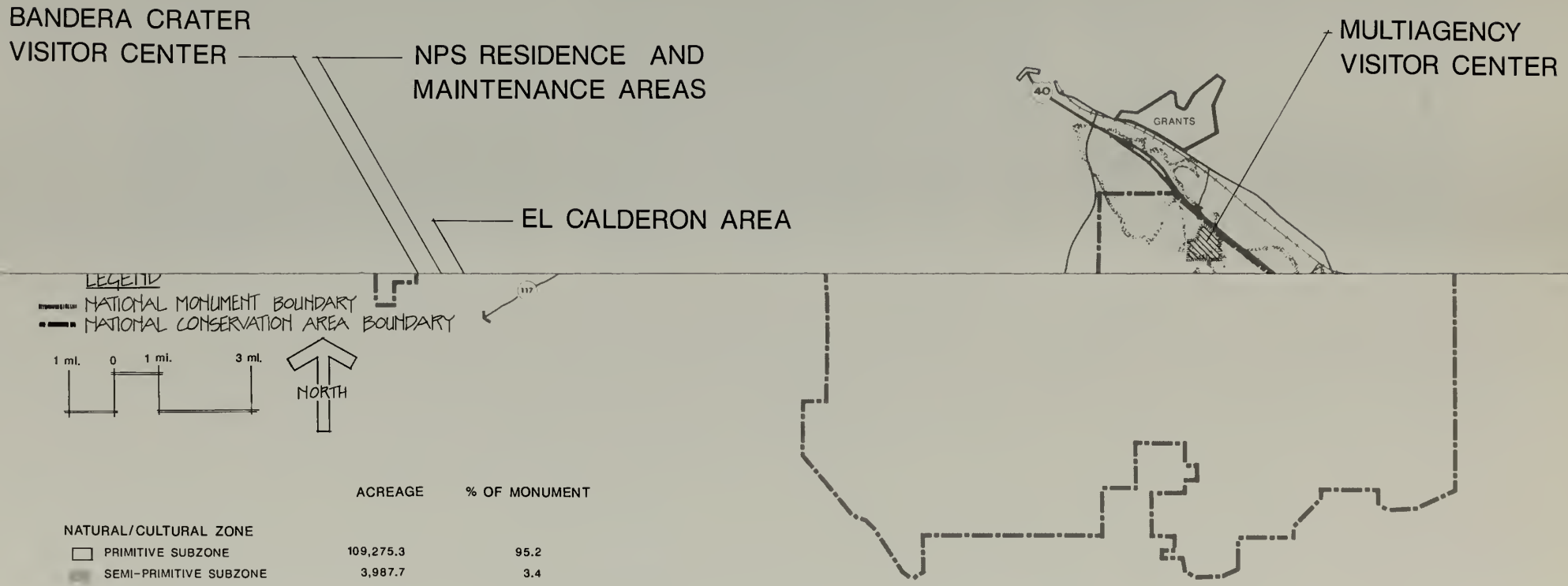

	ACREAGE	% OF MONUMENT
NATURAL/CULTURAL ZONE		
PRIMITIVE SUBZONE	109,275.3	95.2
SEMI-PRIMITIVE SUBZONE	3,987.7	3.4
MONUMENT DEVELOPMENT ZONE		
RUSTIC SUBZONE	455.2	0.4
DEVELOPED SUBZONE	730.7	0.6
SPECIAL USE ZONE		
TRANSPORTATION SUBZONE	399.4	0.4
TOTAL	**114,848.3**	**100.0**

* ALL LAND IS DEPICTED IN THE SUBZONE WHERE IT WOULD BE CLASSIFIED IF AQUIRED BY THE NPS. FOR THE LOCATION OF PRIVATE LANDS, REFER TO THE LAND PROTECTION PLAN

MANAGEMENT ZONING

EL MALPAIS NATIONAL MONUMENT

U.S. DEPARTMENT OF THE INTERIOR/NATIONAL PARK SERVICE

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BANDERA CRATER VISITOR CENTER

NPS RESIDENCE AND MAINTENANCE AREAS

EL CALDERON AREA

MULTIAGENCY VISITOR CENTER

ZUNI–ACOMA TRAIL

TRADING POST AREA

LAS VENTANAS

ROUTE 42

SANDSTONE BLUFFS

EAST RENDIJA AREA

ACOMA–ZUNI TRAIL

BRAIDED CAVE

THE NARROWS

LEGEND

NATIONAL MONUMENT BOUNDARY

NATIONAL CONSERVATION AREA BOUNDARY

1 mi. 0 1 mi. 3 mi.

NORTH

	ACREAGE	% OF MONUMENT
NATURAL/CULTURAL ZONE		
PRIMITIVE SUBZONE	109,275.3	95.2
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MONUMENT DEVELOPMENT ZONE		
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SPECIAL USE ZONE		
TRANSPORTATION SUBZONE	399.4	0.4
TOTAL	**114,848.3**	**100.0**

* ALL LAND IS DEPICTED IN THE SUBZONE WHERE IT WOULD BE CLASSIFIED IF AQUIRED BY THE NPS. FOR THE LOCATION OF PRIVATE LANDS, REFER TO THE LAND PROTECTION PLAN

MANAGEMENT ZONING

EL MALPAIS NATIONAL MONUMENT

U.S. DEPARTMENT OF THE INTERIOR/NATIONAL PARK SERVICE

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hikers); no facilities will be developed in this subzone. The semi-primitive subzone will be oriented toward visitors who wish to reach relatively secluded areas of the monument without having to hike for extended distances. Human activity and influence in this subzone will be minimal, but evident – for example minor development necessary for resource protection or designated campsites. (These subzones are described in detail in appendix C.)

Traditionally, natural and cultural resources are identified separately in management zoning frameworks. However, these two types of resources have been combined into one category at El Malpais because of

> the close relationship between the natural environment and cultural sites,
>
> the entire natural landscape being part of the cultural landscape,
>
> the special religious importance of many of the culturally significant sites within the monument to one or more of the local American Indian groups (the identification of these sites in a specific zone could attract inappropriate uses that might compromise the integrity or sanctity of the sites), and
>
> the knowledge of the location and extent of the numerous natural and cultural resources in the monument is so incomplete that their separate identification is not practicable at this time.

The **monument development zone** will be managed to provide and maintain the facilities necessary to serve the needs of visitors and management. This zone includes areas where certain development and/or use may alter the natural environment or the setting of culturally significant resources. To the extent possible, this zone will maintain the natural and cultural character of El Malpais while accommodating visitor use and monument management activities. Any national register sites in this zone will be managed in consideration of the provisions of their designation. Development and use will be controlled in a manner that will provide visitors with a quality recreational experience. The monument development zone is further divided into the **rustic** and **developed subzones.** The rustic subzone will provide only occasional to moderate opportunities for solitude (depending on season). Although natural processes will be maintained, some human alterations and intrusions will be evident – for example a vehicular campground or interpretive shelter. The developed subzone will provide the primary visitor experience for most of El Malpais' visitors and will include all major facility development – visitor centers, maintenance facilities, housing, etc. (These subzones are described in detail in appendix C).

The **special use zone** includes the activities carried out on private lands within the monument boundaries. NPS administrative control over use of lands in this zone is either absent or is secondary to that of other parties. The special use zone is limited to a **transportation subzone** that includes the state highways and attendant rights-of-way.

The management zoning framework, including subzones, is graphically depicted on the Management Zoning map. Although this map shows the zoning for the entire monument, the zoning will have no effect on nonfederal lands unless and until the Park Service actually acquires those lands or interests. However, the zones as shown indicate the management emphasis that would be placed on these nonfederal areas should they be acquired. It must be stressed that the integration of private property into management zones does not imply permission for public use of that property. Public use of these tracts will not be permitted until the lands are acquired by the federal government. Further, the regulatory stipulations of each zone or subzone do not limit the rights of private property owners.

Finally, it is important to recognize that any or all zones (including subzones) may contain resources that are either unidentified or whose significance is not yet fully determined. The management strategy in regard to the lands in federal ownership is to identify these resources through surveys, determine their significance, and prescribe their protection and treatment for preservation. Eligible cultural resources on federally owned lands will be nominated for listing on the National Register of Historic Places. Similarly, significant natural resources may qualify as units of the National Natural Landmarks program or be set aside as research natural areas and receive special management protection. The superintendent may declare special zoning designations in areas that are found to contain especially significant and/or

fragile resources or that are needed for research purposes. Any special zoning designation that may be established will be managed under conditions specified by the superintendent.

The Visitor Experience in the Management Zones

This section briefly describes the predicted type of experience visitors will have in the four subzones of the natural/cultural and monument development zones of El Malpais National Monument. Additional information on the frequency of encounter with other people, the character of interpretive media, and the standards of roads and trails are in the section of this document on recreational activities and in appendixes C and D.

In the **primitive subzone**, which has no roads and few marked routes, visitors will feel self-reliant and like they are exploring. They will find interesting features and at times commune with the beauty and harshness of their surroundings. Some visitors will orienteer to selected destinations, such as remote lava caves, but even then they will have a sense of original discovery as they explore in solitude.

In the **semi-primitive subzone**, with its relatively difficult access on rough roads and on simple marked routes, visitors will travel to features such as lava caves and collapses and feel immersed in an undisturbed land. They will have few reminders of the civilized world and will be largely reliant on their own observations to attach meaning to the natural and cultural landscape.

In the **rustic subzone**, with its gravel roads and well-defined trails, visitors will travel to interesting natural and cultural features, and they can camp if they chose. They will have opportunities to learn about their surroundings through on-site interpretive media such as exhibits and pamphlets; however, they will also enjoy interesting natural features at their own pace.

In the **developed subzone**, with its visitor centers, paved and one-way tour roads, and gentle trails shared with numerous people, visitors will feel directed along a predetermined sequence of stops. There will usually be many other tourists around, some of whom will have limited time and are only seeing certain highlighted resources. Many of the monument's most significant and spectacular features are deliberately included in this subzone to give visitors with limited time or ability chances to see some significant and representative features of the monument.

Jurisdiction

It is NPS policy to obtain concurrent jurisdiction within units of the national park system. The Park Service currently has only proprietary jurisdiction in El Malpais National Monument. Within the monument, concurrent jurisdiction will be sought for all areas except the NM 53 and NM 117 rights-of-way, which would remain in proprietary jurisdiction.

VISITOR FACILITIES/DEVELOPMENT PLAN

The monument headquarters, visitor centers, operational facilities, roads, trails, viewpoints, and campgrounds are described in this section on visitor facilities. Facilities will be designed for minimum damage to resources and to harmonize with the surrounding environment. Structures will be the minimal size necessary to accomplish their function, and trails and viewing platforms will be properly designed and constructed to discourage off-trail use. Nonreflective materials and natural colors will be used where possible, and signs will be the minimum necessary to guide and educate the visitor. Facilities will also be designed for low-consumptive water use. (See appendix D for a description of the trail standards that are shown on the maps in this section and appendix E for a discussion of design guidelines for these facilities.)

Disturbed areas will be revegetated, restoring the natural resource values and visual integrity of these sites. This revegetation/reclamation would be carefully balanced with natural recovery (i.e., these areas would blend with the existing landscape, maintain genetic integrity, and prevent introduction/spread of exotic species). Only plant materials native to the site will be used for revegetation. Topsoil will be removed and stockpiled for use during reclamation. Mulch matting, silt fences, hydromulching, check dams, and other erosion reduction techniques will be used. Appropriate measures will be taken to protect cultural resources during the revegetation process.

Prior to construction, development sites will be surveyed and evaluated for federal and state

threatened or endangered plant and animal species. An archeological survey will be undertaken prior to development. Facility development and increased visitor use will also be monitored over the life of the plan, providing the Park Service and other federal agencies with updated information on local, federal, and state protected species.

It should be noted that all areas of the monument are currently accessible 24 hours a day. The plan considers that some of these areas will be closed during the night with lockable gates to protect monument facilities and resources or ensure visitor safety.

Following are site-specific development plans.

Administrative Headquarters

Although currently in the former Forest Service building in Grants, the monument's headquarters will ultimately be moved to a place that will accommodate the staff as it grows to the proposed level (which is described in a later section on staffing). This location will be leased, located in Grants, and will meet the criteria for space and other NPS requirements. Grants is a central location and is the most effective site for the headquarters. There is currently an ample supply of reasonably priced rental space available in Grants. Placing primary administrative functions in the multiagency center or at the Bandera visitor center is undesirable because of the likely conflict of two functions in one building and because of the potential of administrative functions to impinge on visitor functions. Combining administrative and visitor functions in one building would also likely compound costs of new construction. (A larger visitor center would also increase impacts on the natural and visual environment.) Also, being in Grants, the monument staff will have convenient access to local, state, federal, and tribal officials with whom the staff must work on a regular basis.

Multiagency Center, Grants

As shown on the following Multiagency Center DCP (development concept plan) map, the multiagency center in Grants will be convenient to a paved access road from the I-40 interchange at the east end of the city of Grants in a detached portion of the national monument. Approximately 443 acres of land will be acquired in fee, beginning from the southern I-40 right-of-way south to a common boundary with the conservation area. Effective signs will be provided on I-40. The purposes of the multiagency center are described in the "Visitor Services/Interpretation Plan" section.

Although adjacent to a busy interstate and a proposed industrial park (including a National Guard building), the multiagency center site will be distinguishable from adjacent uses, reflect a design that is indigenous to the region, and have an aesthetic appearance consistent with NPS design standards. The entrance will be easily identifiable. A distinctive name for the facility will be important (perhaps "Land of the Ancients"). The building will use passive solar energy, and external utilities will connect with existing lines from Grants.

Careful site selection will result in an optimal location for the facility. Designers will work with the Greater Grants Industrial Development Foundation to mitigate adverse effects of the industrial park that is planned, part of which is within the existing monument boundary near the visitor center site. (See "Monument Boundary Adjustment" section for further discussion of this situation.)

The approach road and landscaping for the building will adhere to the principles of quality design (as described in appendix E) and also ensure that the facility has ample surrounding space to maintain its visual integrity. Landscaping for the grounds and entrance road will be a blend of native trees, shrubs, grasses, and groundcovers. The parking area for the visitor center will have native deciduous shade trees, and because the parcel is relatively level the parking area will be screened from the I-40 interchange where feasible.

The main view from the visitor center will be the unobstructed southern panorama of both the monument and the conservation area. Because this view is important for orienting the visitor to the monument's geography, design will be conducted with special care.

The center will be fully handicap accessible and contain almost 7,000 square feet. A detailed discussion of the size and functions of the visitor center is included in appendix F. The center will include the following:

an information/reception area, with information desk, orientation exhibits to features and activities in the area, and identification of the different agencies involved in the center

a publication display and sales area

a travel planning area where visitors can refer to information and maps to refine travel plans

an exhibit area with audiovisual (AV) units, in alcoves and/or as parts of exhibits

an AV theater

a plaza adjoining the building, which has shaded seating for summertime visitors to escape the sun, serves as a waiting area for family or group members, is a starting point for a short loop trail (with interpretation of features that can be seen from the trail), and which can be used for occasional talks and demonstrations by American Indian craftspeople

office/working space for employees of the facility

public restrooms

In addition to the National Park Service, agencies that have expressed at least a tentative interest in being represented in the building include the Bureau of Land Management, the U.S. Forest Service, the Pueblo of Acoma, the Ramah Navajo Chapter, the Grants Chamber of Commerce, and the New Mexico Division of Tourism.

All media for the center will be planned and designed by the NPS Harpers Ferry Center to ensure continuity of design. Other interested agencies will be consulted and interested American Indian groups will be fully involved in the development of interpretive messages related to their interests and cultural perspectives.

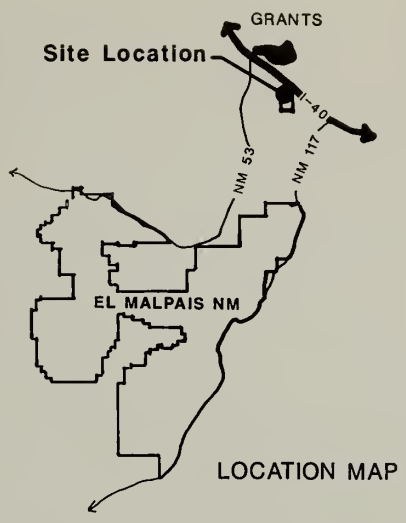
The Park Service will design and construct the multiagency center. Agreements with other agencies will be negotiated relative to staffing and sharing the operational costs.

Bandera Crater Area

The Bandera visitor center will be the primary interpretive facility for the national monument (see "Visitor Services/Interpretation Plan" section). With the roads and trails for the Bandera Crater area (described below), the plan provides access to the monument's largest, most interesting and significant volcanic crater. Development in this area will also provide visitors an opportunity to see one of the most interesting ice caves and the historic trading post complex.

The Bandera visitor center will be constructed approximately .7 mile south of the NM 53 junction (see Bandera Crater Area DCP). The site is gently sloping, in view of a prominent lava flow to the east, and just below the northeast side of Sandstone Ridge. The building site also has a northeast exposure, is dotted with evergreen trees and shrubs, and has sparse native grasses. The site faces a lava-edge ecotone of pinyon, juniper, and aspen trees that outline the west side of the lava flow. Major views from the site include Lava Crater, Cerro Candelaria, Sandstone Ridge, and the surrounding forest and meadows.

The visitor center will be representative of regional vernacular architecture. Because the visitor center will be on a relatively small, prominent site, care must be taken to minimize the visual impact of the building from NM 53 and the loop road. Earth-sheltering should be considered. In form, materials, and color, it will be designed to blend harmoniously with its immediate environs. The grounds of the visitor center will be landscaped with native plant materials. Views to the local peaks and lava flow will be used in the design. A view deck on the east side of the visitor center will be oriented to these views and provide a designated area for interpretive talks relating to the resources. Parking will be screened with existing shade trees where feasible to soften the intrusion of the pavement. The design of the building will also take full advantage of the site's potential by using passive solar energy. The entryway will be easily distinguishable and offer basic visitor information.



LOCATION MAP

MULTIAGENCY CENTER DCP

EL MALPAIS NATIONAL MONUMENT

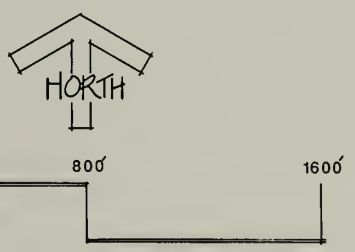
U.S. DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

DSC/JULY 1990/103/20,017A

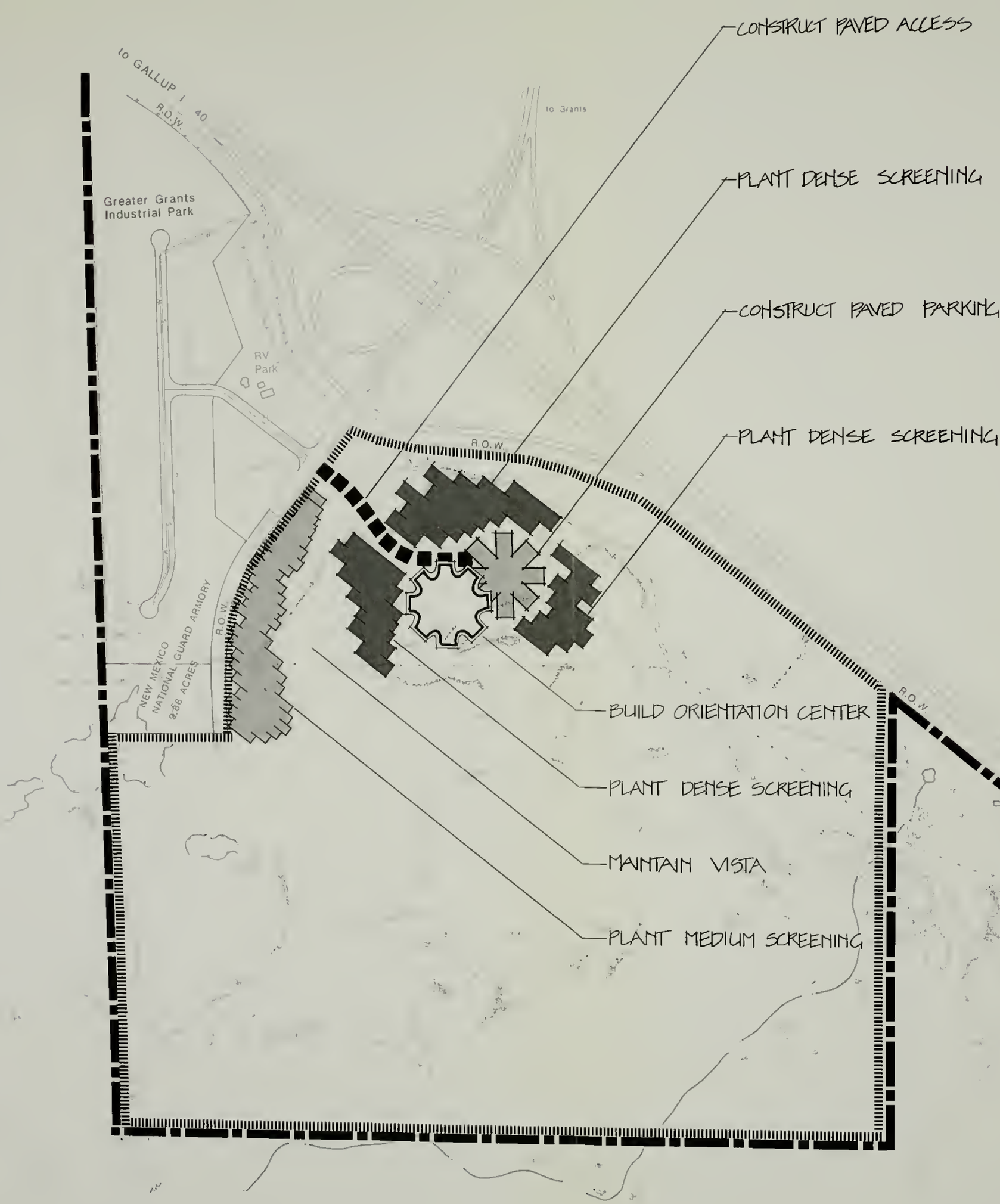
LEGEND

NPS MONUMENT BOUNDARY

BLM CONSERVATION AREA BOUNDARY



NOTE:
BOUNDARY LINES, ROAD, PARKING & BUILDING LOCATIONS ARE APPROXIMATE. ACTUAL ALIGNMENTS TO BE DETERMINED.



MULTIAGENCY CENTER DCP

EL MALPAIS NATIONAL MONUMENT

U.S. DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

DSC/JULY 1990/103/20,017A

LEGEND

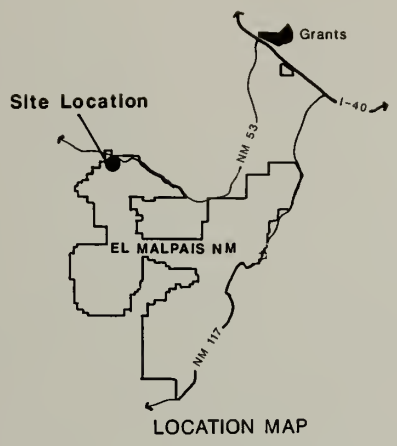
MPS MONUMENT BOUNDARY

BLM CONSERVATION AREA BOUNDARY

NORTH

0' 200' 400' 800' 1600'

NOTE:
BOUNDARY LINES, ROAD, PARKING & BUILDING LOCATIONS ARE APPROXIMATE. ACTUAL ALIGNMENTS TO BE DETERMINED.



LOCATION MAP

BANDERA CRATER AREA DCP

EL MALPAIS NATIONAL MONUMENT

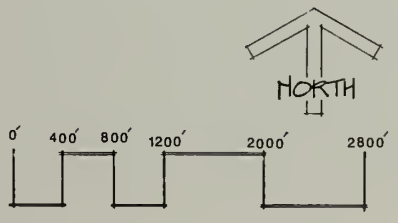
U.S. DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE

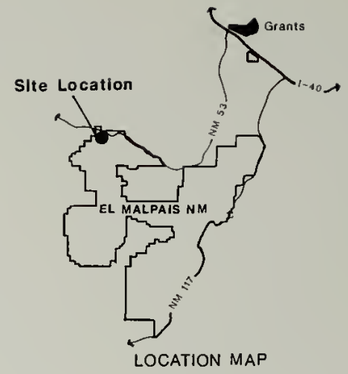
DSC/JULY 1990/103/20,010A

LEGEND

- PROPOSED PAVED ROAD*
- PROPOSED GRAVEL ROAD*
- PROPOSED NEW TRAIL OR UPGRADE*
- EXISTING DIRT ROAD
- ROAD CLOSURE

* ROAD, PARKING & TRAIL ALIGNMENT ARE APPROXIMATE. ACTUAL ALIGNMENTS TO BE DETERMINED.





LOCATION MAP

BANDERA CRATER AREA DCP

EL MALPAIS NATIONAL MONUMENT
U.S. DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE
DSC/JULY 1990/103/20,010A

LEGEND

- PROPOSED PAVED ROAD*
- PROPOSED GRAVEL ROAD*
- PROPOSED NEW TRAIL OR UPGRADE*
- EXISTING DIRT ROAD
- ROAD CLOSURE

* ROAD, PARKING & TRAIL ALIGNMENT ARE APPROXIMATE. ACTUAL ALIGNMENTS TO BE DETERMINED.

NORTH

0' 400' 800' 1200' 2000' 2800'

The approximately 7,500-square-foot center[3] will be handicap accessible and include the following (a detailed discussion of the size and functions of the visitor center is included in appendix F):

an information/reception/circulation area, with an information desk

a sales and publications display area, with storage and workspace

an auditorium/AV room

an exhibit room, with AV units in alcoves and/or as part of the exhibits

NPS office space/workrooms and small storage area (for facility and district ranger personnel)

a view deck, with a trailhead for a short interpretive trail to the margin of the nearby lava flow

access to a trail to the top of Sandstone Ridge

public restrooms

Access to the center will be a new two-way paved road off NM 53, approximately 1.3 miles east of the existing access road to the trading post. This new two-way road will be designed for cars and tour buses and will bring all visitors to the new visitor center just below the northeast side of Sandstone Ridge.

Two trails will begin at the visitor center. A nature trail east of the building will wind approximately .5 mile along the lava flow ecotone. This trail's purpose will be interpretive, bringing visitors in close contact with the variety of trees and shrubs and the jagged aa lava. A second trail will be constructed to the top of Sandstone Ridge where there would be splendid panoramic views of the local craters, including Bandera Crater and Lava Crater. Mount Taylor (near Grants) and several areas on the east side of the monument would also be visible. This trail will continue on to the trading post, and another trail will branch southward to Spattercone Valley (see Bandera Crater Area DCP map).

Two-way traffic will end at the visitor center parking area, but a one-way paved tour road will continue 2.0 miles farther to a second new parking area just east of the trading post. This new parking area (designed in two or more small areas and not one large area) will be selectively sited to reduce impact on the natural vegetation, deter erosion, and prevent visual impact on the historic scene. This new parking area will have about the same capacity as the parking area at the Bandera visitor center (37 cars). The existing historic parking area will not generally be used for parking vehicles, but may be used as a drop-off zone for maintenance supplies and emergency operations. The tour road will be designed for slow traffic speeds (25 mph) and tour buses; the need for pullout parking for scenic vistas will be considered during design. Careful alignment will be necessary to incorporate scenic vistas while minimizing disturbance of the easily erodible hillsides and natural vegetation as the road winds around Sandstone Ridge. Minimal interference with the natural water drainage along the lava flow margins will be incorporated into road design. This one-way road will enable visitors to approach the volcanic terrain of the area in a leisurely manner. A small picnic area with at least one wheelchair-accessible table will be provided near the trading post parking area. Both picnicking and parking represent a continuation of past and existing functions in this area.

The one-way tour road will continue .8 mile from the parking area near the trading post to NM 53 on an alignment that on the southern end is slightly east

3. If the proposed Zuni Canyon Tourist Railroad (described under "Regional Recreation Resources and Use in the "Affected Environment" section of the draft plan) is demonstrated to be feasible and is subsequently developed, certain modifications in the facilities for the Bandera Crater area may be required. The railroad could increase the number of recreationists who would frequent the Bandera Crater area, which might require larger facilities than are currently proposed. Depending on the proximity of the terminus to the Bandera visitor center, it may be necessary to consider an increase in parking space or decrease in visitor stay and to develop a means of transportation between the terminus and the visitor center. The National Park Service will work closely with local officials to ensure that the railroad will not compromise the quality of the visitor experience or the preservation of resources in the Bandera area.

of the existing road. There will be lockable gates at the beginning of the one-way tour road and at the tour road exit to NM 53 to aid in management operations and resource protection.

There will be parking and a trailhead along the one-way tour road for the trail to Dripping Lava Cave and Lava Crater. The existing dirt trail will be used, as appropriate, for the new trail alignment. The .6-mile trail to Dripping Lava Cave and catwalk-like steps will descend into the precipitous entrance and continue to the end of the cave past features that include a perennial ice pond and dripping lava formations. (Dripping Lava Cave is one of the best opportunities in the monument for visitors to experience an underground "big cave.") The Park Service will provide lanterns or flashlights for use in the cave.

A trail climbing southward to the rim of Lava Crater will branch from the trail to Dripping Lava Cave. Because of the rough terrain at the rim of Lava Crater, this trail will not be a loop. (See Bandera Crater Area DCP and also the "Visitor Services/ Interpretation Plan" section for representations of the entire trail system in the Bandera Crater area.)

To accommodate increased visitation and additional interpretive services, the existing Candelaria trading post will be rehabilitated in a manner compatible with its past history and function and used as a staffed/unstaffed information center for orienting visitors to the Bandera area and trail system. This historic structure may also serve as a shelter in inclement weather or as a meeting place for special events, school or bus tour groups, etc. The interior will be brought up to NPS health and safety standards. Although the narrow doorways and other structural features of the trading post currently make wheelchair accessibility difficult, it is a goal of the general management plan to provide handicapped visitors physical access to this structure.

However, prior to any modification of the structures or historic setting, a historic structures report will be prepared to document and analyze all periods of construction and modification, building techniques, source materials, evidence of use, and historic setting of the buildings, grounds, and related structures. Once the buildings have been brought up to NPS standards, a historic structures preservation guide will be prepared to direct preservation maintenance activities and provide orderly and timely inspection and upkeep of the structures.

Because the trading post complex (including the Ice Cave and Bandera Crater, which are used for religious purposes by the Zuni) is thought to be eligible for inclusion on the National Register of Historic Places for its significance in early-day New Mexico tourism and for its traditional cultural importance to the contemporary Zuni, proposals for adaptive reuse and other modifications will be developed in consultation with the New Mexico State Historic Preservation Office, the Advisory Council on Historic Preservation, and American Indians prior to any structural or landscape changes.[4]

Two of the former tourist cabins will be rehabilitated and adaptively reused as restrooms, and another cabin will be stabilized, fitted with period furnishings (using existing furnishings to the extent possible), and interpreted as an example of an early-day tourist cabin (see Trading Post Area DCP). The exteriors of all of the original tourist cabins will be preserved, consistent with the historic structures preservation guide. All structures to be rehabilitated in the trading post area will be treated consistent with the secretary of the interior's *Standards for Rehabilitation*. After compliance with section 106 procedures, noncontributing structures, including pit toilets, will be removed.

There will be a wheelchair-accessible trail between the parking area and the trading post. This trail and others described below will be carefully blended with the historic scene and compatible in materials and design; they will also meet NPS safety standards for this type of trail (see appendix D on trail standards). Signs in the area of the trading post will be visually compatible with the setting.

The existing trail from the trading post to the Ice Cave will be improved, interpreted, and made wheelchair-accessible; this will require some regrading and use of ramps in short sections to meet the necessary standards. The steep wooden

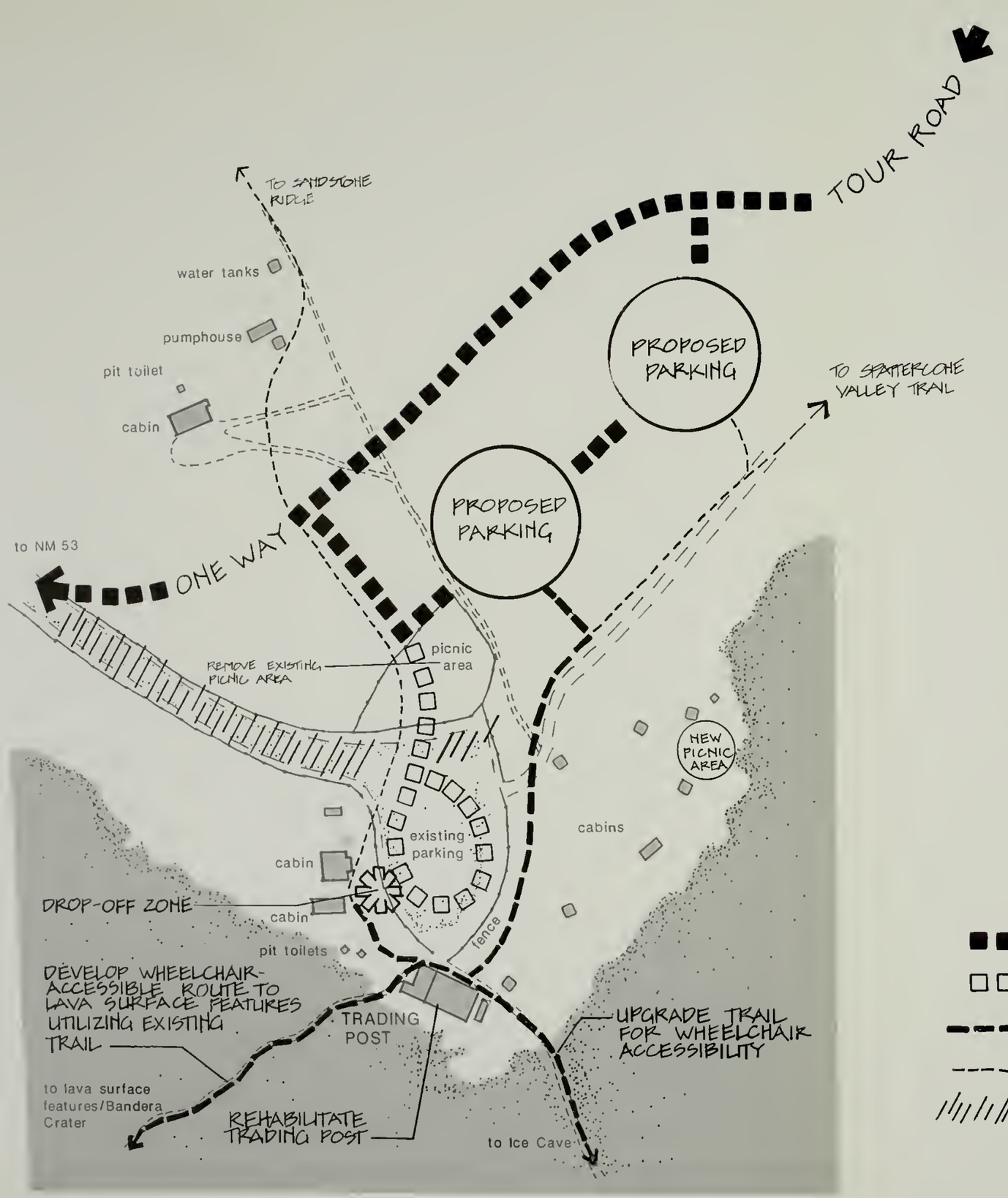
4. National register forms are being prepared.

TRADING POST AREA DCP

EL MALPAIS NATIONAL MONUMENT

U.S. DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

DSC/JULY 1990/103/20,019B



LOCATION MAP

TRADING POST AREA DCP

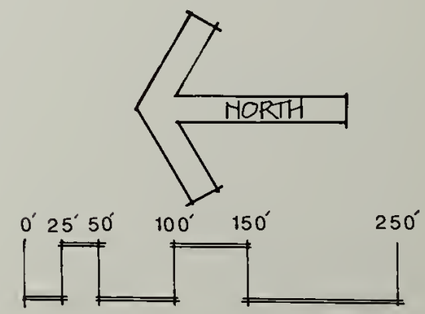
EL MALPAIS NATIONAL MONUMENT

U.S. DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

DSC/JULY 1990/103/20,019B

LEGEND

- PROPOSED PAVED ROAD
- PROPOSED GRAVEL SERVICE ROAD
- PROPOSED WHEELCHAIR-ACCESSIBLE TRAIL
- HIKING TRAIL
- OBLITERATE & REVEGETATE ROAD



stairway into the Ice Cave will be replaced using compatible materials and design, keeping with the natural and historic scene and conforming with the *Uniform Federal Accessibility Standards*. There will be a platform provided at the rim or in conjunction with the stairway structure so that visitors in wheelchairs can see the interior portions of the cave. These modifications will not be inappropriate, considering the 50-year continuum of changes in these features to facilitate visitor use.

A new wheelchair-accessible loop trail from the trading post to nearby lava surface features (spattercone and tree molds) will be provided and principal features will be interpreted; much of this trail will be on an existing alignment. The existing trail to Bandera Crater (the old motor tour route) beyond the spattercone will also be maintained and interpreted as part of the historic scene. The trail to Bandera Crater is composed of relatively loose cinder, which is subject to unsightly damage including scarring of steep slopes and loss of bedrock when visitors leave established trails. Signs will be posted on the trails where necessary for visitor safety and resource protection. Unauthorized off-trail use in the Bandera area will be monitored and controlled to minimize scarring and erosion of fragile cinder slopes. Using existing alignments of the Ice Cave and Bandera Crater trails, portions of which will be wheelchair accessible, is a significant mitigation in reducing disturbance of geologic features and cultural resources and maintaining the historic scene in the Bandera area.

There will be interconnecting trails to Spattercone Valley, Sandstone Ridge, and Bandera Crater (see Bandera Crater Area DCP). There will also be a new trail from the Ice Cave that will intersect the trail to the summit of Cerro Bandera (described below in the description of East Rendija).

It is crucial that new construction such as trails and landscaping in the vicinity of the trading post exhibits a sense of unity and a sound functional relationship with the existing architectural elements of the trading post and cabins as well as with the natural landscape. That is, any new structures near the trading post will be compatible in form, style, mass, color, material, texture, and scale with the old.

An abandoned sawmill site, dumps, and ruins of cabins historically associated with the regional lumber industry are in the vicinity of the visitor center in the Bandera area and will likely be obliterated by construction. Archeological testing and documentation will be completed prior to the final comprehensive design for the visitor center, and the sites will be mapped to document their location, size, and arrangement. It has been determined in consultation with the New Mexico State Historic Preservation Office that these sites are not eligible for nomination to the national register.

Stone circles in the vicinity of Bandera Crater will be stabilized and interpreted to visitors as part of the area's prehistoric heritage.

To provide the facilities essential for interpreting and protecting the Bandera Crater area and other western portions of the national monument, four single-family residences, a four-unit apartment building, a four-bay maintenance building, and parking and utilities for monument personnel and maintenance operations will be built. Employees residing in monument housing will provide a 24-hour presence that will help deter vandalism and theft, and staff will be well positioned to make after-hour gate closures and respond to emergencies. The residences and maintenance facilities will be behind a forested hill, about .5 mile east of the visitor center (see Bandera Crater Area DCP). This location is within walking distance of the visitor center, yet it is fully screened from visitors by topography and forest. These buildings and associated facilities will be accessed from NM 53 by a new paved service road, about 1.3 miles east of the new visitor center entrance road. This road will skirt the western edge of a large open meadow at the base of a small bluff, then turn westward toward the residential and maintenance area.

The architecture of the residences and apartment building will be consistent with the regional vernacular style and also use passive solar energy. Colors and materials will blend with the immediate environs. Each residence and the apartment building will have exterior landscape elements delineating private, semi-private, and community space. Minimal disturbance of natural vegetation will be a top priority in locating each structure and the parking areas. Careful attention will be taken to screen the residential area from the noise and visual intrusions associated with the maintenance area.

The maintenance area will be near the residential area for emergency responses and will consist of an elongated single-story structure with four parking bays, a workshop, a small office, and rescue/fire cache storage. The building will be of regional vernacular architecture, with materials and colors that blend with the immediate environs (the site may be visible from public trails at Lava Crater and Sandstone Ridge). The design will use passive solar energy. Parking for most maintenance vehicles will be adjacent to the building, and the perimeter of the parking area will retain large trees and shrubs. Because of the often harsh winters, indoor parking space is needed for selected vehicles to ensure dependable operations during periods of cold weather and to retard the deterioration of the equipment. Heated and well-ventilated indoor work areas will be incorporated in the design to provide work space during winter months. A security fence will probably enclose the maintenance compound.

The cinder and borrow pits in the Bandera area will be recontoured and restored to natural appearance.

East Rendija Area

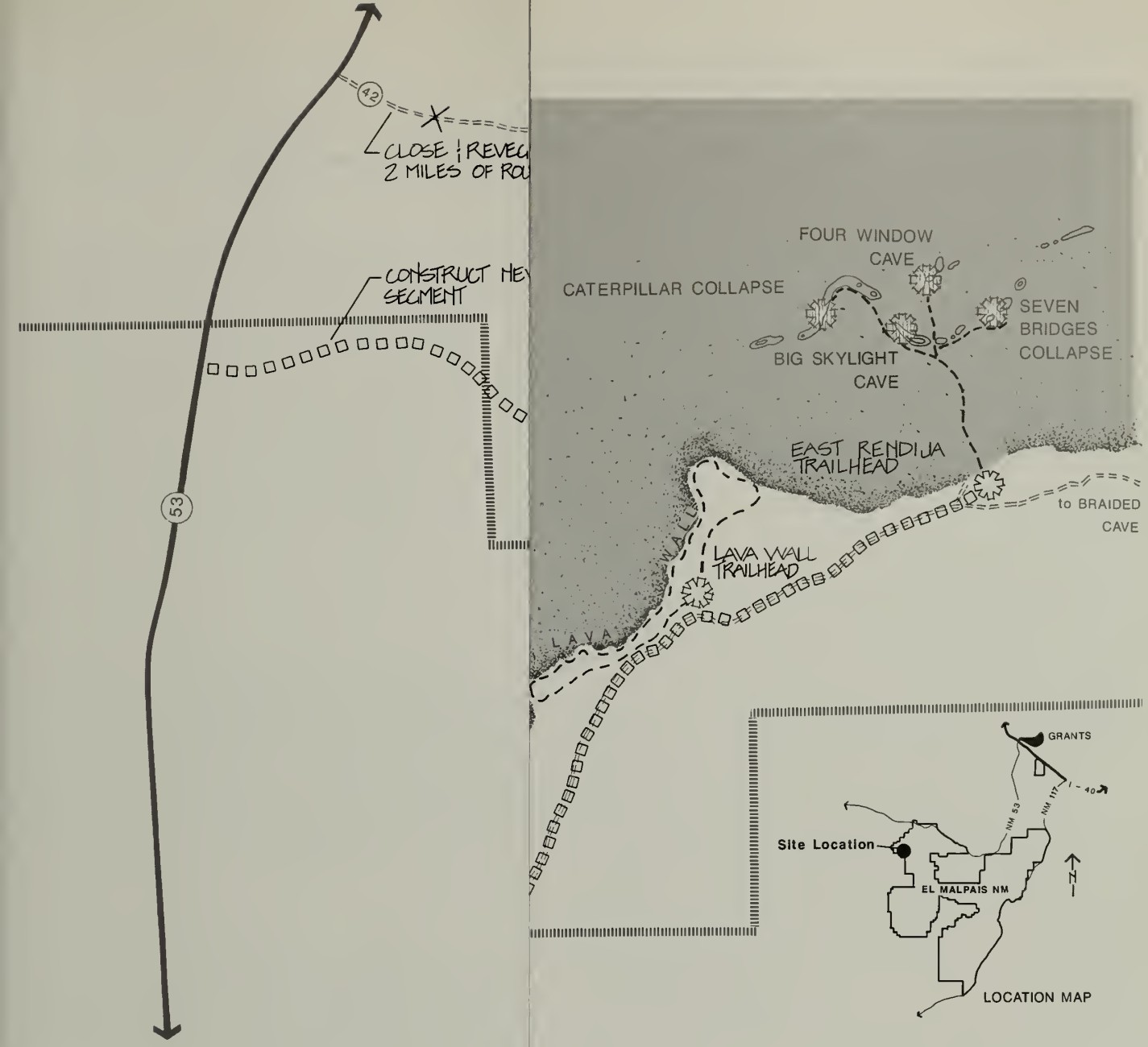
Although the Bandera Crater area contains many spectacular volcanic features for visitors to see, the East Rendija area complements it with an array of lava surface and lava tube features that are not seen near Bandera Crater. These include a massive lava wall, enormous caves with "windows," and other phenomena that illustrate the dynamics of fluid lava.

Beginning northwest of Cerro Bandera and leading south from NM 53, the road will be a two-way, gravel-surfaced road that will lead to the Cerro Bandera trailhead and on to East Rendija (see East Rendija Area DCP). Several segments of the road will be elevated to avoid major maintenance problems, reduce maintenance costs, provide proper drainage (i.e., to prevent pooling on the roadway), and ensure reliable and safer access to East Rendija by two-wheel-drive vehicles. A passable, well-defined roadway will keep motorists on the road and reduce environmental damage while retaining a rustic, natural experience. The improved road will also improve access for management patrol and emergency operations.

The northernmost 2 miles of the 6-mile Route 42 east of Cerro Bandera will be realigned to the west side of Cerro Bandera, which will improve sight distance and safety at the NM 53/Route 42 intersection. The existing 2 miles of Route 42 east of Cerro Bandera will be closed (to eliminate views of vehicles and dust seen by visitors at Bandera Crater and Cerro Bandera), and the abandoned section will be restored to its natural condition, thereby restoring the variety of plant and animal species along that portion of the Bandera flow ecotone. The middle 2 miles will join the old alignment of Route 42 south of Cerro Bandera, and the last 2 miles will depart from Route 42 and approach East Rendija on the north side of Cerro Rendija (replacing the primitive high-clearance road that now exists). The southernmost 4 miles may or may not follow existing alignments; however the entire 6 miles will stay at least .25 mile inside the monument boundary. (The first mile of this new road may require a future administrative boundary adjustment to be included inside the monument.)

Along the road to East Rendija, new access and gravel parking will serve a new trail that ascends the western side of Cerro Bandera to its summit – the highest point in the national monument and a splendid 360-degree view of the surrounding region. The trail (about 1 mile) will require cutting some slopes of cinder and volcanic agglutinate. This will be mitigated by confining the treadway to areas of relative stability, selecting an alignment to minimize shortcutting, and using side-tread logs, drainage bars, and retaining walls to minimize downslope loss of loose cinder.

A new 6-site (expandable to meet demand) primitive vehicular campground with tables and grates will be built east of the cutoff to East Rendija from Route 42 (see East Rendija Area DCP). The campground will be located on a site with good drainage (but not more than 3 percent slope) and will use existing trees for shade where possible. Each campsite will accommodate at least two vehicles and a maximum of eight people and will be designed to concentrate eating and sleeping activities in comfortable, well-drained areas. Ample spacing and native vegetation between sites will minimize noise and visual intrusions. Parking will be graveled, and there will be vault toilets at the campground. No water will be provided in this portion of the monument.



EAST RENDIJA AREA DCP

EL MALPAIS NATIONAL MONUMENT

U.S. DEPARTMENT OF THE INTERIOR, NATIONAL PARK SERVICE

DSC/JULY 1989/103/20,013

LEGEND

- MONUMENT BOUNDARY
- EXISTING DIRT ROAD
- PROPOSED GRAVEL ROAD *
- PROPOSED GRAVEL PARKING
- NATURAL/CULTURAL FEATURE
- PROPOSED TRAIL*

0' 200' 400' 800' 1600' 3200'

NORTH

* ACTUAL ROAD AND TRAIL ALIGNMENTS TO BE DETERMINED

CLOSE & REVEGETATE 2 MILES OF ROUTE 42

CERRO BANDERA

CONSTRUCT NEW ROUTE 42 SEGMENT

CERRO BANDERA TRAILHEAD

BANDERA

LAVA

FLOW

FOUR WINDOW CAVE

CATERPILLAR COLLAPSE

SEVEN BRIDGES COLLAPSE

BIG SKYLIGHT CAVE

EAST RENDIJA TRAILHEAD

to BRAIDED CAVE

LAVA WALL

LAVA WALL TRAILHEAD

CONSTRUCT PRIMITIVE CAMPGROUND (6 SITES, EXPANDABLE TO MEET DEMAND)

IMPROVE INTERSECTION

GRANTS

I-40

NM 53

NM 117

Site Location

EL MALPAIS NM

LOCATION MAP

EAST RENDIJA AREA DCP

EL MALPAIS NATIONAL MONUMENT

U.S. DEPARTMENT OF THE INTERIOR, NATIONAL PARK SERVICE

DSC/JULY 1989/103/20,013

LEGEND

- MONUMENT BOUNDARY
- EXISTING DIRT ROAD
- PROPOSED GRAVEL ROAD *
- PROPOSED GRAVEL PARKING
- NATURAL/CULTURAL FEATURE
- PROPOSED TRAIL *

0' 200' 400' 800' 1600' 3200'

NORTH

* ACTUAL ROAD AND TRAIL ALIGNMENTS TO BE DETERMINED

There will be a roadside pulloff and gravel parking area to serve a new loop trail to the lava wall feature prior to reaching East Rendija.

A gravel parking area and trailhead will be built at the end of the improved road to East Rendija. Vault toilets will be provided at the trailhead. New trails will be developed to Big Skylight and Four-Window caves, using flat lava surfaces for treadways wherever possible to promote safety and minimize resource damage. Access at appropriate standards will be provided into the caves. There will be primitive marked routes beyond these two caves to Seven Bridges and Caterpillar collapses. These trails will be marked, not constructed, and high-density recreational use in these areas with fragile resources will be discouraged.

Braided Cave

This area provides yet another type of volcanic feature – a lava tube that has numerous reconnecting passages and colorful dripping lava features on the walls and ceilings. Road access to Braided Cave will be the existing primitive routes. The unimproved dirt parking area will remain, and visitors will follow a marked route to Braided Cave. No toilets or water will be provided.

El Calderon Area

Several important lava tube features not present elsewhere in the monument are concentrated in the El Calderon area. These include the long Junction Cave, the deep impressive Double Sinks (caused by collapse of an underlying lava tube), and the well-known Bat Cave that is summer habitat of a large colony of Mexican free-tailed bats.

The existing dirt road to Junction Cave from NM 53 will be partly realigned and improved as a gravel road; a small parking area and trailhead will be provided near Junction Cave. The route to the entrance of Junction Cave will be marked, but visitors will explore it on their own. The new gravel road will be extended south from Junction Cave to a new formalized gravel parking area about .3 mile northeast of Bat Cave. Existing primitive roads in the area of Bat Cave will be closed and restored to natural conditions (see El Calderon Area DCP).

A new .3-mile trail will be built south to Bat Cave, and a new .2-mile trail will lead north to Double Sinks, both trails starting at the new parking area. There will also be a .2-mile trail from Double Sinks to Junction Cave (so that people can leave their cars at Junction Cave and walk to all three features). The trail to Bat Cave will be well marked and easy to follow under poor lighting conditions (the bat flights are at dusk). Vault toilets but no water will be provided at the new parking area. The east tube of Bat Cave will be closed for reasons of visitor health and safety and to protect the bats; viewing of the evening bat flights will be allowed only from a safe distance in an area designated for that purpose. Exploration of the western tube at Bat Cave will not be encouraged because of its proximity to the east side, which is occupied by the bats. The plan allows continued viewing of the bat flights (an existing use) and also considers visitor safety and health and the sensitivity of the bats and their habitat. Studies to be initiated by 1991 call for a baseline biological study including population dynamics of the bat colony. It is the opinion of several scientists that public viewing of the bat flights is highly unlikely to have any disturbing effect on the colony. However, the Park Service will consider the input of qualified specialists in designing the study. Unless the baseline study demonstrates an adverse effect, the plan relating to improved access to Bat Cave will be carried out.

The "Corral road" (northwest of El Calderon) will be kept open until improvements are made on the alternate road just north of El Calderon to support all local through-traffic leading south to the national conservation area. When these improvements are made, the Corral road will be closed to the public and portions will be restored to natural conditions.

Zuni-Acoma/Acoma-Zuni Trail

This 7-mile trail, a marked foot route across four of the five most recent lava flows of the monument, illustrates many surface lava flow features and gives visitors the opportunity to understand what crossing these badlands was like for prehistoric peoples and historic expeditions.

The access road from NM 53 into the parking area on the west side of the trail will remain as existing, but the gravel surface of the parking area will be maintained at a higher standard and the parking islands will be revegetated. The trail from the west

end parking area to the viewpoint will be regraded and hard-surfaced to provide wheelchair access and will blend with the surrounding lava. There will be no toilets or water provided at the trailhead (see Zuni-Acoma Trail DCP).

A small parking area, trailhead, and trail will be provided at the east end of the trail. If these facilities cannot be provided on federally owned land adjacent to NM 117, an easement will be acquired from the Acoma for these facilities.

Las Ventanas

The Las Ventanas site is one of the southernmost outliers of the major prehistoric Chacoan system and was an important regional center to the Chacoan people. With its tower kiva and great kiva, Las Ventanas stands impressively on the edge of the sandstone bluffs that overlook the El Malpais lava flows. In 1981, the partially excavated tower kiva was backfilled by the Park Service and the Archeological Conservancy to prevent deterioration of the walls and protect original fill levels that contain important archeological information.

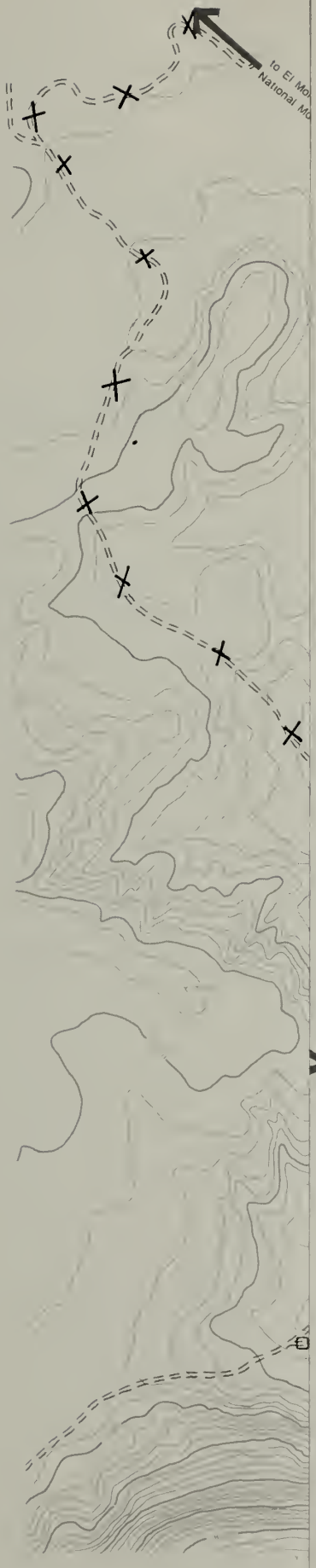
Las Ventanas is cited in the establishing legislation for the national monument as an important site for visitor enjoyment of the Chacoan culture; however, it is also special to the Acoma. The plan seems the only feasible compromise for development at the site. Although a trail is proposed (see Sandstone Bluffs/Las Ventanas DCP and following description), the visitor experience will be controlled because of ranger patrols, carefully aligned and marked paths, and wayside exhibits that will explain the importance of staying on the trails and respecting the resource.

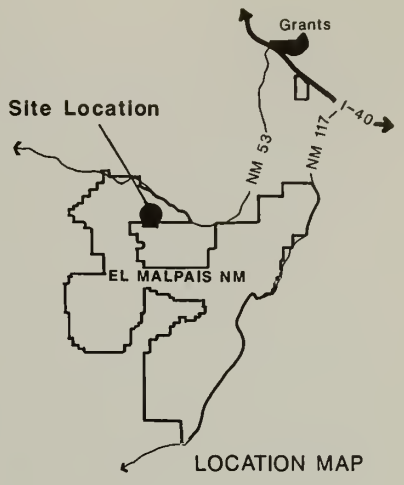
For visitor access to Las Ventanas, a new .3-mile paved spur road will be built west of the first curve in the Sandstone Bluffs road. The spur road will lead to a paved parking area. Access to Las Ventanas will be by a 1.5-mile trail that begins at the parking area and continues northward along the sandstone ridge to several features – a large natural arch, viewpoints of El Malpais, a prehistoric roomblock associated with Chacoan habitation of the area, the tower kiva and great kiva, and traces of a prehistoric road. The great kiva will not be altered from its present state. The trail will be carefully routed to avoid impacts on cultural resources or native vegetation. To better protect the resources, there will be no access to the Las Ventanas trail at night, controlled by the gate on the Sandstone Bluffs road at NM 117 (described below).

The tower kiva and traces of a Chacoan road at Las Ventanas are part of an impressive prehistoric system covering an immense region and including settlements linked by roads and associated signal stations. A view of the circular outline of the tower kiva would add to visitor understanding of its architecture and the possible functions of the tower. To see all or part of the tower would also establish direct visual association between the structure and other features integral to the Las Ventanas site, as well as to the visible region to the north where there are other Chacoan ruins.

The fill mound that covers the previously excavated tower and adjacent parts of the ruin has an artificial appearance, has been invaded by exotic plants, and in the long term is subject to erosion. The mound's purpose in 1981 was simply to protect the ruin rather than enhance any future visitor experience. Even so, removing the fill without clear and detailed plans could impact the ruin many ways.

The draft plan offered two options as to how the ruin would be preserved – either leaving the mound on the tower portion and interpreting the pre-fill appearance with photographs or other media, or exposing at least part of the structure. This decision will require far more specialized evaluation than has been possible under general management planning. A condition assessment report will be done to provide this evaluation. The report will include a full range of alternatives, including no action in regard to the fill, retention but modification of the fill to improve its long-term protective and aesthetic qualities, and varying degrees of fill removal to improve interpretive potential. All the following factors, plus others that emerge during the assessment, will be part of the analysis of alternatives:





LOCATION MAP

EL CALDERON AREA DCP

EL MALPAIS NATIONAL MONUMENT

U.S. DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

DSC/DEC 1989/103/20,015A

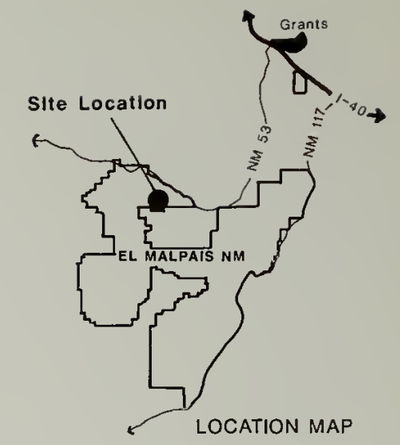
LEGEND

- PROPOSED GRAVEL ROAD
- CLOSED ROAD*
- PROPOSED TRAIL**
- PROPOSED GRAVEL PARKING
- NATURAL/CULTURAL FEATURE

NORTH

0' 200' 400' 800' 1600' 3200'

* CORRAL ROAD WILL BE CLOSED AFTER IMPROVEMENTS ARE MADE TO EL CALDERON ROAD.
** TRAIL ALIGNMENT IS APPROXIMATE. ACTUAL ALIGNMENT TO BE DETERMINED.



EL CALDERON AREA DCP

EL MALPAIS NATIONAL MONUMENT

U.S. DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

DSC/DEC 1989/103/20,015A

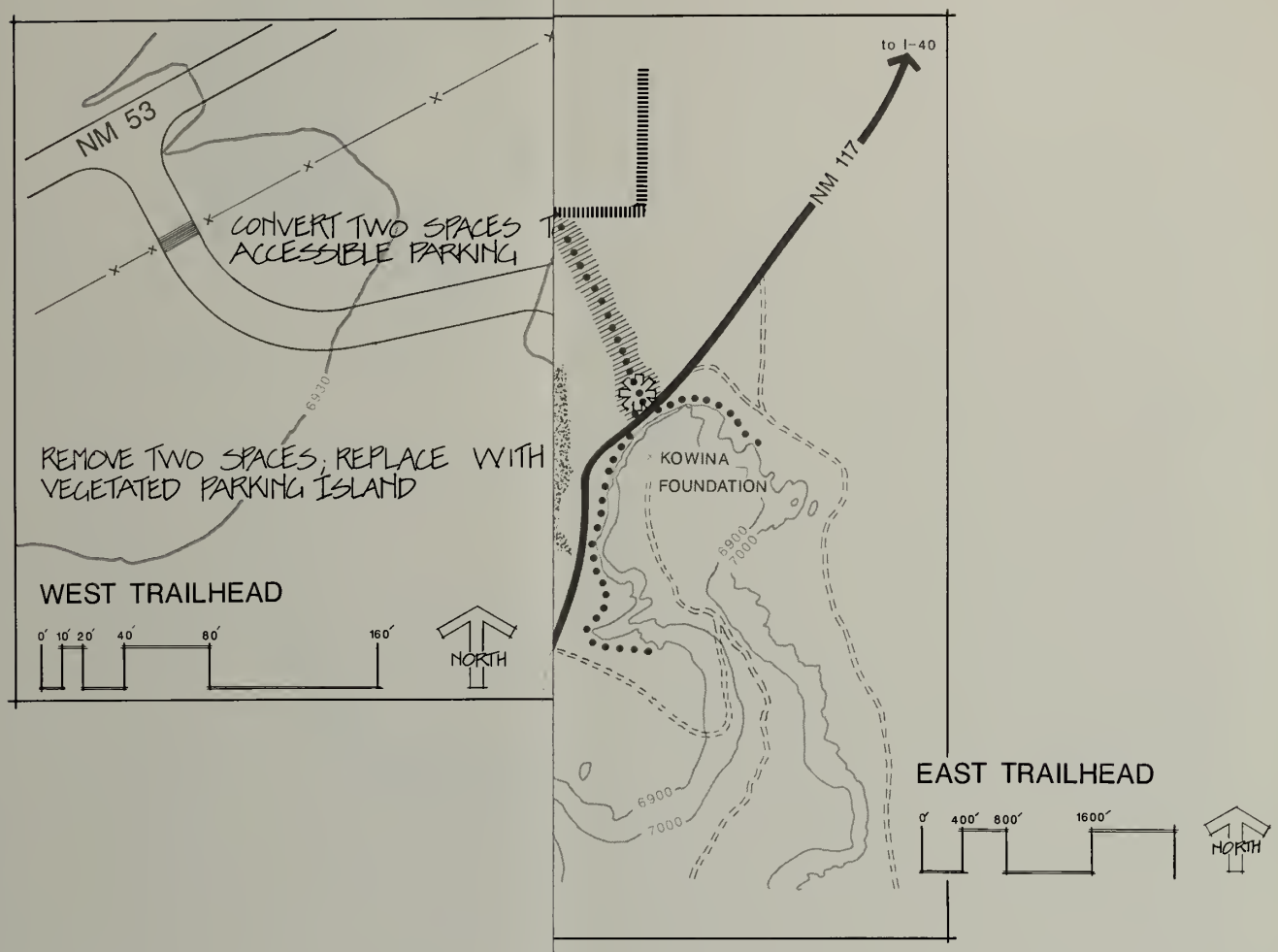
LEGEND

- PROPOSED GRAVEL ROAD
- CLOSED ROAD*
- PROPOSED TRAIL**
- PROPOSED GRAVEL PARKING
- NATURAL/CULTURAL FEATURE

NORTH

0 200' 400' 800' 1600' 3200'

* CORRAL ROAD WILL BE CLOSED AFTER IMPROVEMENTS ARE MADE TO EL CALDERON ROAD.
** TRAIL ALIGNMENT IS APPROXIMATE. ACTUAL ALIGNMENT TO BE DETERMINED.



ZUNI-ACOMA TRAIL DCP

EL MALPAIS NATIONAL MONUMENT

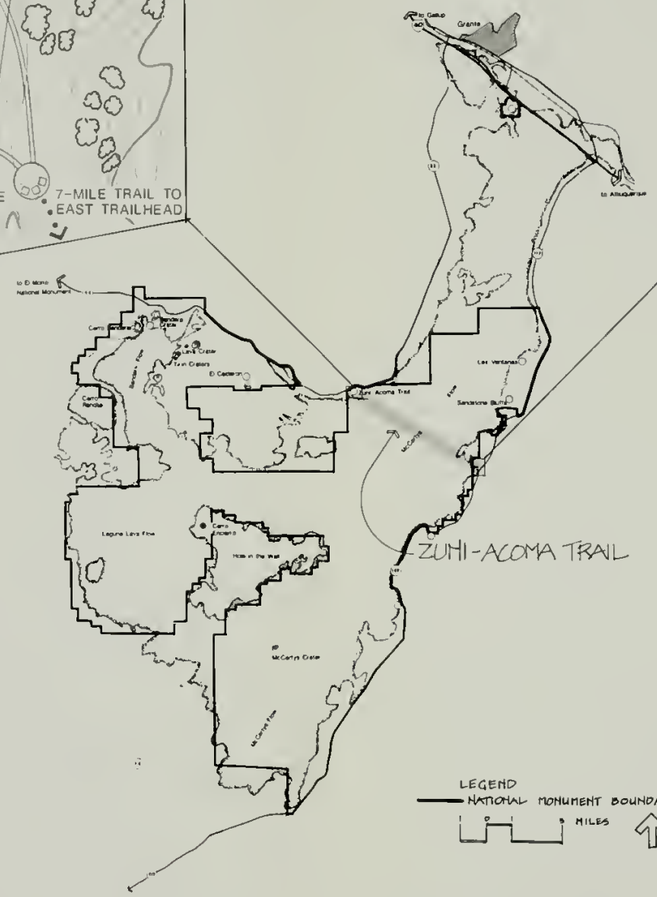
U.S. DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

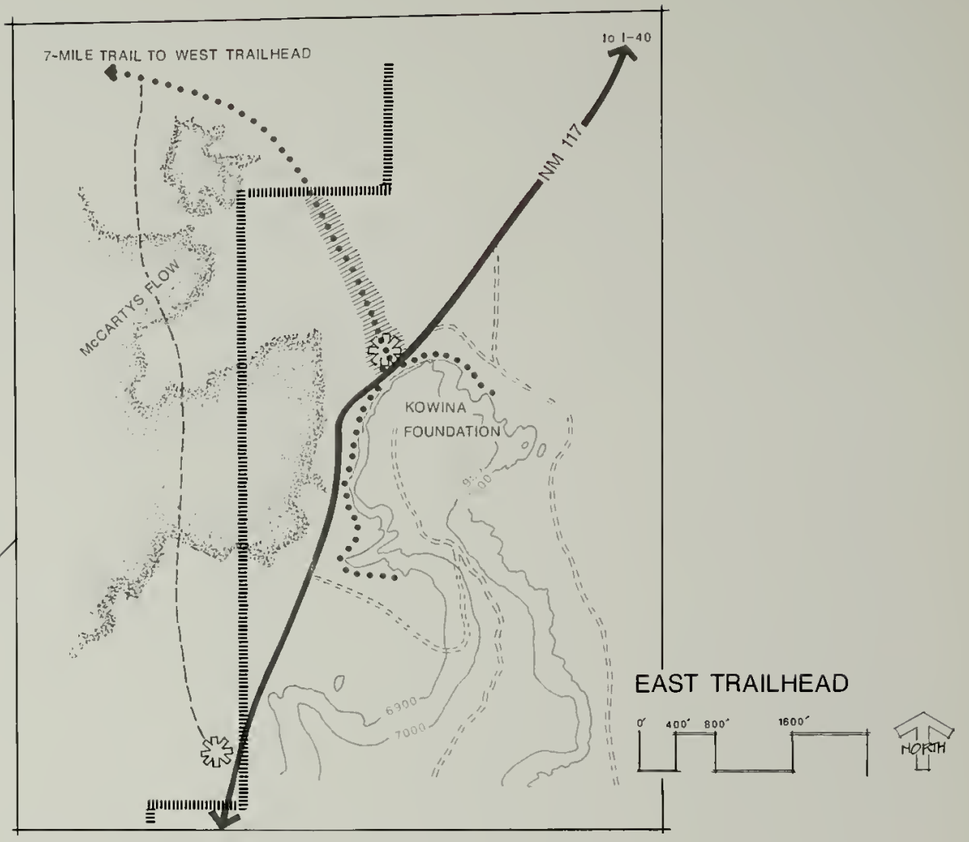
DSC/JULY 1990/103/20,016A

LEGEND

- NPS MONUMENT BOUNDARY
- POTENTIAL EASEMENT*
- POTENTIAL PARKING AREAS*
- PREHISTORIC TRAIL
- PRESENT NPS CONNECTOR TRAIL

* BOUNDARY, EASEMENT & TRAIL ALIGNMENTS ARE APPROXIMATE. ACTUAL ALIGNMENTS TO BE DETERMINED.





ZUNI-ACOMA TRAIL DCP

EL MALPAIS NATIONAL MONUMENT

U.S. DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

DSC/JULY 1990/103/20,016A

LEGEND

- NPS MONUMENT BOUNDARY
- POTENTIAL EASEMENT*
- POTENTIAL PARKING AREAS*
- PREHISTORIC TRAIL
- PRESENT NPS CONNECTOR TRAIL

* BOUNDARY, EASEMENT & TRAIL ALIGNMENTS ARE APPROXIMATE ACTUAL ALIGNMENTS TO BE DETERMINED

LOCATION MAP

SANDSTONE BLUFFS / LAS VENTANAS DCP

EL MALPAIS NATIONAL MONUMENT

U.S. DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE

DSC/JULY 1990/103/20,012A

SANDSTONE BLUFFS / LAS VENTANAS DCP

EL MALPAIS NATIONAL MONUMENT

U.S. DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE

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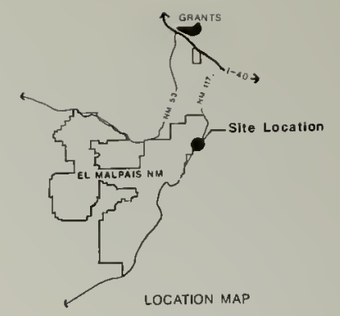
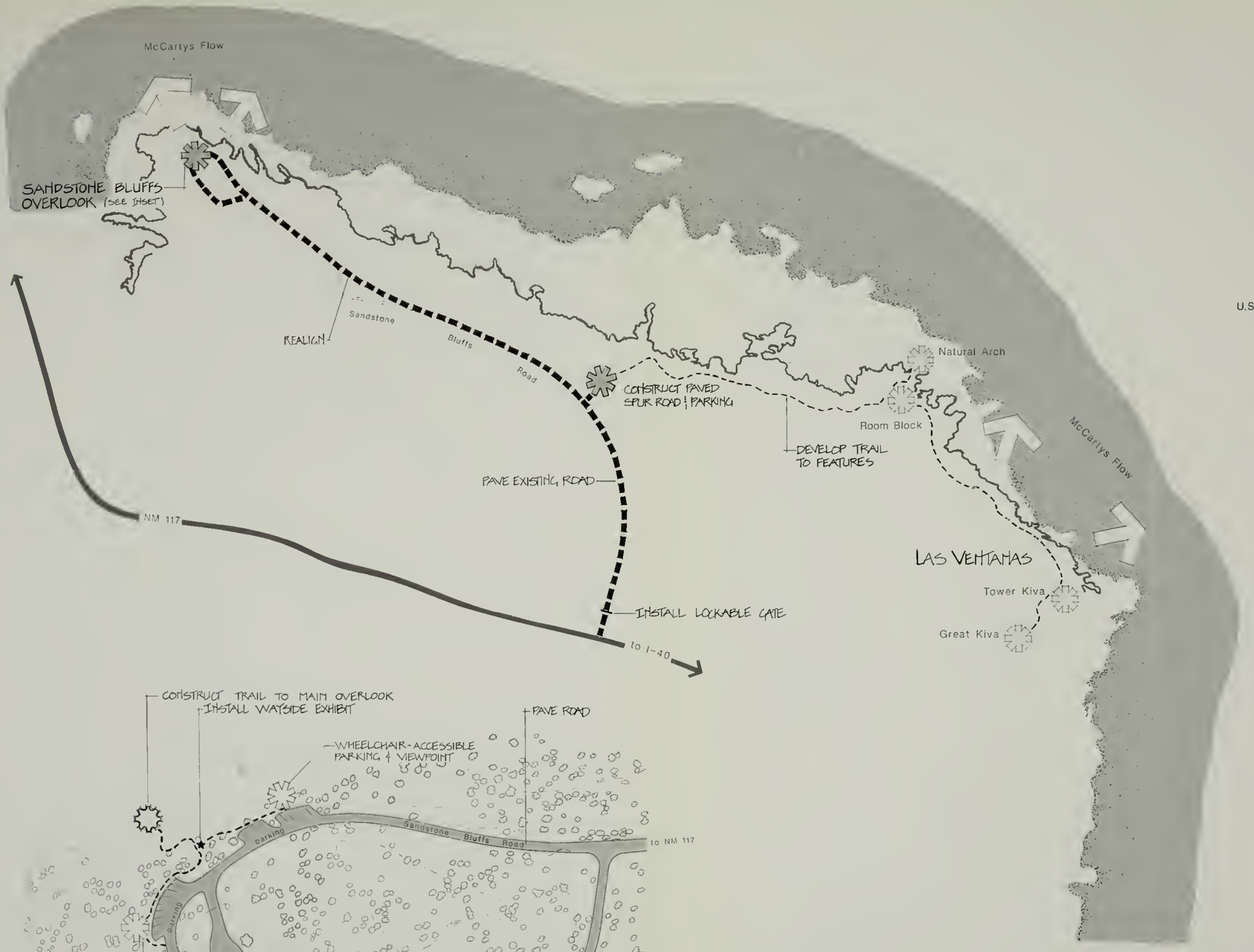


LOCATION MAP

LEGEND

- PROPOSED PAVED ROAD
- EXISTING GRAVEL/DIRT ROAD
- PROPOSED PAVED PARKING
- NATURAL/CULTURAL FEATURE
- PROPOSED TRAIL



PLAN VIEW - SANDSTONE BLUFFS

The effectiveness, limitations, and costs of applying physical preservation methods to mitigate the impacts of the alternatives[5]

The potential for recovery of scientific information that will help illuminate the past for visitors

The cost and other details of cyclic maintenance necessary under each alternative to counteract the effects of visitor use and exposure of the structure to the elements

The long-term effectiveness of fill in preserving the ruin, including the impact of its appearance on the cultural scene and visitor experience.

The relationship of each alternative to visitor enjoyment of other prehistoric resources in the area, such as the Chacoan road and the great kiva.

The modes of visitor access and qualities of experience for each alternative, including the sequence, content, and media of interpretive stations, containment of foot traffic, use of specialized barriers, and other mitigations such as education to protect the structure.

The balance between visitor use and resource preservation must be responsive to the purposes of the national monument, including Las Ventanas, as stated in the El Malpais legislation. Identification of the key interpretive values is necessary to carefully weigh the relative factors of visitor experience as well as resource protection, research potential, and costs in the condition assessment report. For this reason, an interpretive planner will serve as a consultant to cultural resources specialists in preparing the report.

Following prepartion of the condition assessment report, a detailed action/design report analogous to an historic structure report will be done to implement the decisions. The condition assessment report will precede preparation of more detailed plans for interpretive media at Las Ventanas.

Because the site is on the National Register of Historic Places, the New Mexico State Historic Preservation Office, and the Advisory Council on Historic Preservation if necessary, will be consulted to help develop mitigation procedures. In consultation with American Indians, particularly the Acoma, the effects on religious values will be fully considered.

Sandstone Bluffs Overlook

This overlook provides the only opportunity for visitors to orient themselves to the principal landscape features of the monument by looking out over the lava flows. To continue and improve this traditional visitor use, the existing gravel-surfaced road to Sandstone Bluffs from NM 117 will be paved, with one sharp curve realigned to improve vehicular safety. (As mentioned above, there will be a new spur road from this road to the parking and trailhead for Las Ventanas.) The parking area at Sandstone Bluffs will be modified and paved, and wheelchair-accessible vault toilets will be added adjacent to the wheelchair-accessible parking spaces. Trampled areas will be revegetated and native vegetation protected. The loose soils in the area will be stabilized with engineering fabric and base aggregate.

There will be trails to two overlooks; one trail and adjacent parking will be accessible to visitors in wheelchairs. The trails will be as compatible as possible with the sandstone outcrops, and cutting sandstone surfaces to accommodate the trails will be avoided to the greatest possible extent; smooth, well-drained natural sandstone surfaces will be used in level areas if possible. All facilities will be designed to minimize visual intrusion on this sandstone landscape while providing safe, easy access (see Sandstone Bluffs/Las Ventanas DCP).

There will be a lockable gate on the Sandstone Bluffs road at NM 117 that will be closed at night,

5. As identified in the draft plan, these impacts include the effects of impeded drainage, differential soil pressure, etc., on the structural integrity of the ruin, the effects on masonry, wall plaster, and other prehistoric archeological and architectural features and objects in and adjacent to the ruin; and effects on other scientific values such as disturbance of spatial context, loss of information because of future advances in archeolgocial technique, etc.

thereby helping protect the visitors and resources in this area.

Several old stone buildings in the vicinity of Sandstone Bluffs will be evaluated for their significance and integrity – possibly as part of a historic resource study (see "The Plan for Cultural Resources Management" section).

The Narrows

Several areas along NM 117 were examined as potential sites for visitor access onto the impressive McCartys lava flow. All but one – the Narrows area – were rejected because of fragile biological resources or the presence of areas important to the Acoma Indians.

A short loop trail for viewing the lava surface features and dwarf trees will lead onto the McCartys lava flow (see the Narrows DCP). Portions of the trail will be handicap-accessible if possible.

The New Mexico State Highway and Transportation Department is studying realignment of the curves on NM 117 on both the north and south ends of the Narrows. Some of the potential realignments at the south end of the Narrows could provide new opportunties for siting the parking for the lava loop trail in locations where this parking would have little impact on views from the BLM's rim trail to the east. That some of the realignment options also could impact the Narrows environment is all the more reason for the Park Service to join with other interested parties in planning any realignment that may be necessary. Final evaluation and decisions for the lava trail and parking area will occur when the highway issues are resolved.

McCartys Crater Area

The Park Service is in communication with the Department of Defense about removing bombs and related debris from this past military bombing range in the monument. Some objects have already been removed, and the Park Service and the department are planning the systematic search and removal of remaining ordnance. In the interim, safety of the few visitors who desire to enter this area will be controlled by permit.

Roadside Kiosk along NM 117

An orientation/information kiosk will be built near the south entrance of the monument/conservation area along NM 117 (refer to General Development map). The kiosk, an open-air/shade structure developed cooperatively by the Park Service and Bureau of Land Management, will have a paved parking area, be visually prominent, and provide visitor orientation to features ahead in the national monument/conservation area. The kiosk will be on the south side of the highway in the conservation area, west of the intersection with Route 42.

Other Facilities along NM 117

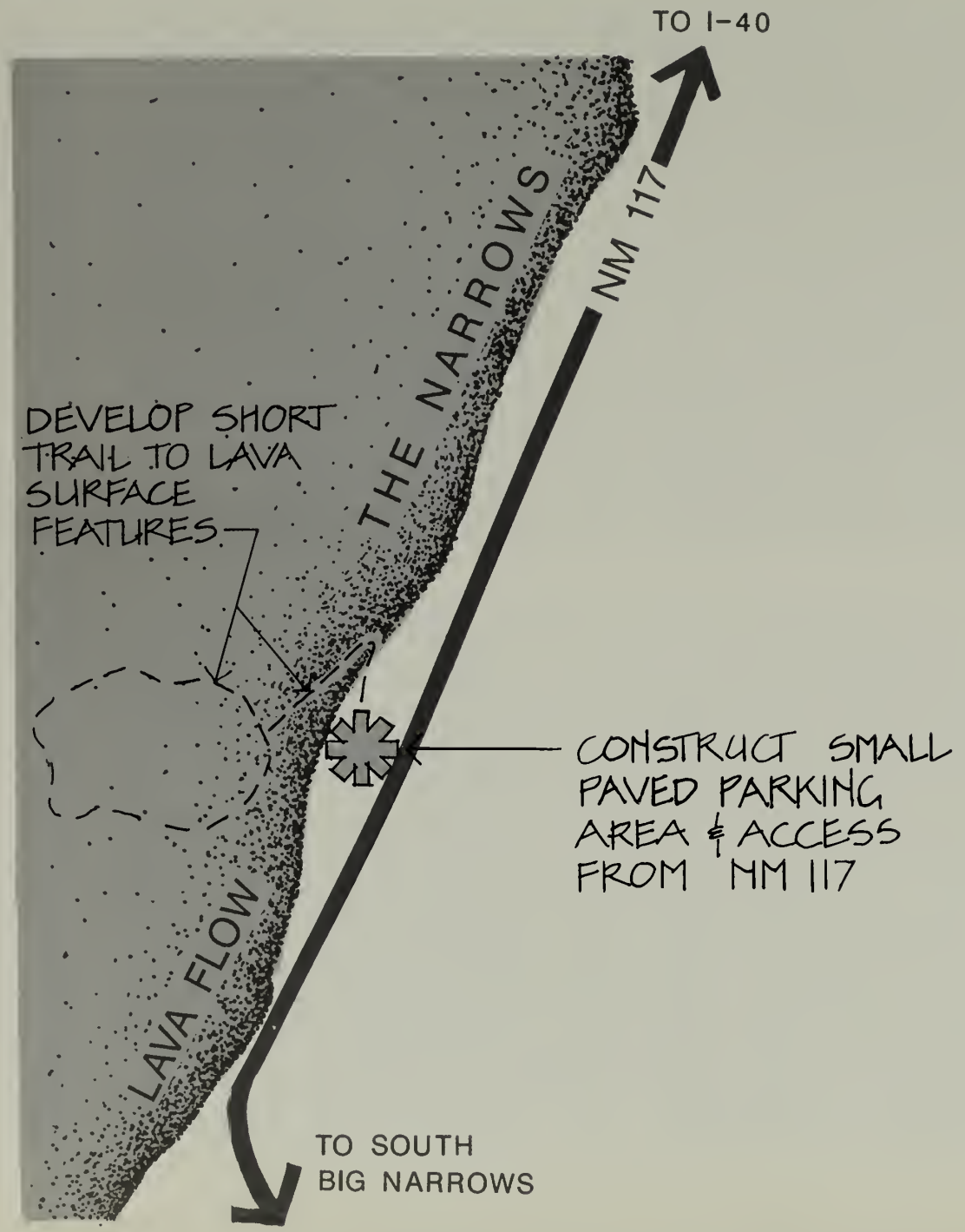
The Bureau of Land Management's *Draft General Management Plan* proposes additional visitor use facilities along NM 117. These facilities are mentioned briefly here to give the reader an overall picture of all visitor activities along NM 117 (refer to General Development map).

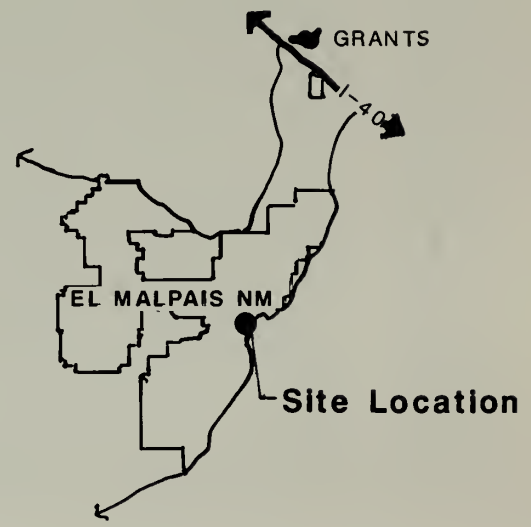
There will be a 2,700-square-foot ranger station/public contact station, with paved parking for about 30 cars and five RVs or busses and an interpretive trail that would highlight local flora and cultural features. Included will be an information/reception foyer, book sales and display areas, storage space, and office and residence for seasonal employees. A well has been drilled to provide water for restrooms and drinking water. The site is about 9 miles south of I-40 on NM 117 (in section 32, T 9 N, R 9 W). (The Bureau of Land Management began construction of the building in July 1990.)

There will be a new gravel parking area and loop trail to La Ventana natural arch. The trail will be wheelchair accessible to a photo point. Vault toilets will also be provided.

At South Big Narrows, the access will be redesigned and a gravel parking and picnic area provided. There will also be a trailhead and a trail leading into the Cebolla Wilderness.

Improved access will be provided to the Dittert archeological site; there will be gravel parking and a short trail to the site.





LOCATION MAP

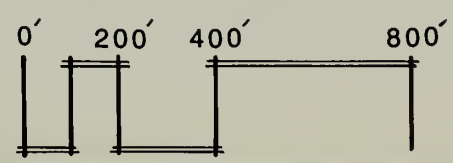
THE NARROWS DCP

EL MALPAIS NATIONAL MONUMENT

U.S. DEPARTMENT OF THE INTERIOR

NATIONAL PARK SERVICE

DSC/JULY 1990/103/20,018A



There may be information structures in three locations – one at each of the northern boundaries of the conservation area on NM 117 and NM 53 and one at the western boundary of the conservation area on NM 53. The Park Service will design all three parking areas and information structures in consultation with the Bureau of Land Management, and the Bureau of Land Management will construct and maintain these facilities.

Also, the Pueblo of Acoma has expressed an interest in developing their Kowina Foundation property. Based on future consultation, the Park Service and the Bureau of Land Management could extend technical assistance to the tribe toward this objective.

Coordination with Road Authorites

Inasmuch as the boundaries of El Malpais National Monument incorporate the rights-of-way for adjacent sections of NM 53 and NM 117, and because portions of other public roads are within the monument, the Park Service will coordinate with government road authorities and other entities in resolving matters of concern that affect monument values. Potential road-related topics include safety, signing, law enforcement, maintenance, access to and from intersecting roads and adjacent pullouts, bicycle lanes or pathways, fencing, reconstruction, right-of-way designation, and environmental protection (including American Indian needs).

Continental Divide Trail

The National Trails System Act of 1968 (P.L. 90-543, as amended) authorized the study of the Continental Divide National Scenic Trail (CDNST). The possibility that the CDNST could pass through the Bandera Crater/Cerro Bandera area and continue southward toward the national conservation area was considered during NPS planning. However, planning for the CDNST in New Mexico has not yet progressed to the assessment or decision stage, and actual designation of the route will be coordinated by the U.S. Forest Service, the lead agency for the project. The Park Service and the Bureau of Land Management will be among the entities included in planning for the route, and both agencies will contribute information on the impacts of the alternatives to the Forest Service's environmental document for the New Mexico portions of the CDNST.

Designation of the CDNST within El Malpais appears compatible with the purposes of the national monument. However, the location of the CDNST in the monument would have to be determined after evaluating the sensitivity of the resources in the areas under consideration. The concerns of American Indian groups will also be considered.

Based on existing knowledge, if the CDNST were to cross the main lava flows of El Malpais, the Zuni-Acoma Trail would be the preferred route. However, this premise needs to be assessed with all the other alternatives that would affect monument resources and visitors.

Concessions

Because of the close proximity of the monument to the communities of Grants, Milan, and Ramah, there is no need for concession facilities in the monument. The three communities provide adequate services for the projected number of visitors. Commercial services available in Grants, Milan, and Ramah (merchandise sales, food and beverage service, motor vehicle fuels and service, and lodging) are currently not being used to capacity, and there is potential for considerable growth in the service sector of these communities, as well as on private lands closer to the monument.

Sales of publications relating to the monument and its interpretive themes will be undertaken at outlets in the two visitor centers by a nonprofit cooperative association. Currently, the Southwest Parks and Monuments Association has been authorized to assume this role.

Facility Capacity

Recreation visits to the monument are projected to increase substantially during the next seven years, with the highest concentrations occurring in the Bandera Crater area. To accommodate projections, a new visitor center, roads, parking, and trails will be constructed at Bandera as described previously. The plan contains mitigations to confine visitors in such a way that resource damage will be

minimized, and other areas will be monitored for adverse effects and steps taken as necessary to alleviate these effects.

The location of facilities, especially parking, greatly influences the use of frontcountry and backcountry areas. Parking areas will be located in sites with potential for expansion to help alleviate potential adverse effects on resources and the visitor experience. There will be at least 90 parking spaces dispersed in the general Bandera Crater area alone, including the visitor center. Trails in the Bandera Crater area will be designed for visitors with differing skills and preferences. Trails will be routed in loops, wherever feasible. More than 10 miles of trails will be available in the Bandera Crater area, and there will be more than 25 miles of trails available within the monument.

Table 1 itemizes the parking capacities along all monument road corridors once the plan is implemented. These capacities are based on visitor projections for 1995. When the design phase for these facilities is initiated, the capacities will be reevaluated and, if necessary, adjusted in consideration of actual visitation and revised projections at that time. From these capacities, the theoretical maximum number of persons at one time (PAOT) was calculated by multiplying the average number of persons per car (2.8) times the number of parking spaces. (The NPS nationwide average is 2.8; El Malpais as yet has no data.) The PAOT has been rounded to the nearest "whole person." The PAOT total also assumes that four tour buses (each averaging 30 passengers) will enter the monument each day. Campground sites are calculated for two vehicles and eight people maximum per each site.

The theoretical daily capacity of persons was derived by totaling the PAOT and multiplying that by a turnover rate of five (based on a 10-hour use day with a 2-hour average length of stay). Backcountry sites, the East Rendija campground, and tour buses have a multiplier of 1. Site-specific turnover rates were not used to calculate daily capacity because in several cases the length of stay is only 10 or 15 minutes or visitors do not stop at all; thus, the results would be grossly inflated and of little value.

Further expansion of roads, parking, and other facilities will occur only if it is determined through a visitor impact management analysis that the new facilities are inadequate and additional visitor facilities can be accommodated without causing unacceptable deterioration of natural and cultural resources or visitor experiences.

Special Populations

The lobby, auditorium, exhibit area, and restrooms associated with the multiagency center and the Bandera visitor center will be wheelchair accessible. Where possible, select exhibits and programs at these two centers will accommodate the sensory and mentally handicapped. These two centers will also provide information on the location of facilities throughout the monument/conservation area that are designed for the handicapped. The design for these two visitor centers will incorporate signing, curb cuts, parking space striping, ramps, and other appropriate accessibility considerations. Wheelchair-accessible trails will be provided to the Ice Cave, lava surface features near Bandera Crater, the Zuni-Acoma trailhead and overlook (west end), one overlook at Sandstone Bluffs, and possibly a portion of the lava features at the Narrows. There will also be a wheelchair-accessible viewing platform at the Ice Cave for visitors in wheelchairs or those who are not able to use the stairway. The cumulative effect of these opportunities will provide special visitors with a quality experience at a representative portion of the monument's resources.

Any new visitor or employee facilities and any alterations to existing facilities will comply with the appropriate laws and regulations, including the Architectural Barriers Act of 1968 (42 U.S.C. 4151 et seq.) and the Rehabilitation Act of 1973 (29 U.S.C. 792 et seq. and NPS-28). The plan must also comply with 1988 NPS *Management Policies* that state, "to the greatest extent possible, commensurate with physical limitations, the handicapped should be able to enjoy the park using the same facilities as the nonhandicapped visitor. Special interpretive facilities and programs for handicapped people are encouraged where good potential for participation is indicated."

Water Development and Use

Congress directed the Park Service to preserve the significant natural and cultural resources of the lava flow area and manage it for the benefit and

Table 1: Parking Capacity Along Road Corridors - Preferred Alternative

Sites Serving Frontcounty*	Vehicle Spaces	Theoretical Max. Paot	Theoretical Daily Capacity
Multiagency center	47	132	
Bandera visitor center	37	104	
Trading post	37	104	
Dripping Lava Cave	15	42	
Cerro Bandera	6	17	
East Rendija trailheads	15	42	
El Calderon	15	42	
Zuni-Acoma (west)	15	42	
Acoma-Zuni (east, if feasible)	6	17	
Sandstone Bluffs	27	76	
Las Ventanas	6	17	
The Narrows	6	17	
Subtotal	**232**	**652**	**x5 = 3,260**
East Rendija Campground**			
12 (sites) x 8.0 people	=	96	+96
Subtotal		**748**	**3,356**
4 tour buses** (x 30 passengers)	=	120	+ 120
Subtotal		**868**	**3,476**
Sites Serving Backcountry**			
Braided Cave	4	11	
Cerro Encierro	4	11	
Other entry points	4	11	
Subtotal		**33**	**33**
Frontcountry		868	+3,476
TOTAL		**901**	**3,509**

*Average length of stay is predicted at two hours or less.
**Average length of stay is predicted at full day.

enjoyment of present and future generations, which includes the resource of naturally occurring water. Operating staff and visitor facilities will require a water supply for consumptive use. To carry out this congressional mandate, the Park Service needs the legal right to the necessary water. This legal right to water will be secured through state appropriative and federal reserved water rights.

The monument is in an area that is currently involved in a general stream basin water rights adjudication (Rio San Jose Basin Adjudication, State of New Mexico v. Kerr-McGee Corp., et al., Nos. CB-83-190-CV and CB-83-220-CV). The United States has joined in this adjudication, which began prior to the establishment of the monument. The court has ordered the United States to submit its claim to water for the monument by June 1, 1989. Appropriative and reserved water rights for the monument will be claimed in this adjudication.

After securing water rights, attempts will be made develop a ground water supply for domestic purposes. If drilling is successful, water for the Bandera visitor center, trading post area, and the NPS residential and maintenance areas will be served by a new well adjacent to the NM 53 corridor in the Bandera area. A 75,000-gallon tank immediately north of Sandstone Ridge near NM 53 and underground pipelines will store and deliver water to all four areas. If water from the proposed well proves of inadequate quality to treat on site, is of insufficient volume, or is too costly to develop, water will be hauled to the storage tank from a local supplier. Water-saving appliances will be standard throughout area. Both the well and storage tank will be screened from public road and trail corridors.

Septic treatment systems and leachfields will be used at the Bandera visitor center and residential and maintenance areas. Chemical or low-water consumption toilets will be provided at the trading post. Mound sanitary discharge systems may be required in developed areas where soils are shallow.

Other Utilities

Because there is single-phase power in the monument on an aerial line just north of NM 53 near the Bandera Crater area and the only source of three-phase power is 12 miles west of the monument in the Ramah area, the Park Service will make every attempt to design its facilities and utilities at Bandera to use single-phase power, including power for shop and maintenance purposes and water-well pumping. Any new electrical lines within the monument that will be visible to visitors will be placed underground to the greatest extent possible.

Pursuant to one of the basic mandates of the Park Service to preserve scenery, permits for new power lines and other transmission facilities extraneous to the purposes of the national monument will not be granted, except in accord with federal statute and NPS policy.

Upon establishment of the monument, several overhead transmission lines were included within the boundaries. When these lines are to be replaced, the Park Service will identify visually obtrusive portions and attempt to find means of relocating or undergrounding them.

Telephones will be provided at the principal developed areas at Bandera Crater, placing lines underground when practicable.

Radio communication will be provided for the monument using repeater stations in or outside of the monument (the sites have not yet been selected but are under study).

In managing solid waste, the monument staff will cooperate with Cibola County in sorting materials by type for recycling. Nonrecyclable materials will be transported to approved sanitary landfills outside the monument. Activities pertaining to hazardous and toxic materials, including disposal, will conform with NPS policy and other federal, state, and local laws and regulations.

Potential for Earthquake and Volcanic Damage

Because of the general management plan for the Bandera Crater area and other volcanic areas in the monument, it is important to assess the long-term stability of the terrain as a safe place for use and development. Seismically – that is, from the standpoint of earthquakes – Laughlin and West (1976, 7) state: "It should be noted that the Zuni area is one of low seismic activity." Volcanically – that is from the standpoint of future eruptions of lava and cinder damaging property or endangering human life – it is important to realize that basaltic

volcanism of the type represented in the monument almost always begins with natural warning signs that allow hours to days advance notice before actual eruptions. Humans can be evacuated in a timely manner. The Bandera visitor center, residential/maintenance area, the one-way tour road, and the historic trading post complex all occupy lower valley slopes or valley bottoms, and could be destroyed by future eruptions of cinder and lava. However, there is no way to predict exactly where such eruptions might occur in the large Bandera lava field, and there is reasonably little chance that monument developments would be directly affected. The low incidence of eruptions within the time frame of human activity (perhaps 10,000 years ago in the Bandera area) precludes a reasonable risk of capital investment being damaged. In summary, there is no significant expectation of earthquakes or volcanic activity endangering life or property at Bandera or in other parts of the monument.

Floodplain Compliance

There is only one floodplain in the monument, in the southern portion of the existing multiagency center tract. With the boundary adjustment, this floodplain will no longer be within the monument, and flood hazards will not affect human life and property within the areas being developed within the monument.

VISITOR SERVICES/INTERPRETATION PLAN[6]

Introduction

The rugged 114,848-acre volcanic landscape of El Malpais National Monument is well known to many people who live in the immediate region. Nationally, however, El Malpais is virtually unknown as a vacation destination. Currently, the only tourist attraction within the monument is the small, privately owned and managed "Ice Cave and Bandera Crater," approximately 25 miles southwest of Grants on NM 53 (see Existing Conditions map). Approximately 45,000 visitors per year see these two volcanic features at Bandera. An admission fee allows visitors to walk trails to various lava flow features, including the Ice Cave and Bandera Crater. The vast remaining portion of the volcanic badlands in the monument still offers few structured opportunities for visitors.

The plan will provide visitors with reasonable access and an opportunity to experience a representative portion of the resources of this unusual volcanic landscape. Because this newly established area has had little previous use, visitor interests, the number of visitors, and visitor use patterns are difficult to predict. Although the visitor use sites selected will provide a representative experience, only those few sites specifically mentioned by the legislation or sites that provide other primary experiences will be intensively developed. Other visitor use sites will be minimally developed and provide only basic access with no major structural development.

Various types of interpretive media and programs will convey specific themes; however, the overall media concept for interpretation throughout the monument will focus on and contribute collectively to accomplish the following objectives:

> To instill in visitors a love and respect for El Malpais by viewing it from the perspective of local American Indians.
>
> To provide the sense that this is a special place where if one invests the time one can feel the spirit of El Malpais and find one's heart and mind at rest.
>
> To give visitors an understanding of the complex ecological relationships and the place of humans within those relationships.
>
> To enhance visitor understanding of the forces that created this rugged landscape, encouraging firsthand experiences at selected features.

6. This document contains more visitor services proposals in greater detail than normally included in a general management plan; that is, it contains media recommendations and is therefore more on the level of an NPS interpretive prospectus.

To give visitors an understanding of the transition from the Chacoan era to present times.

To provide the information necessary to ensure visitor safety and protection of the cultural and natural resources.

The primary visitor services/interpretation actions will occur in the following areas (refer also to the General Development map):

a new multiagency center adjacent to I-40 (as required by the legislation)

a new NPS visitor center at the Bandera Crater area (as required by the legislation) and associated access to the historic trading post and Ice Cave/Bandera Crater trailhead and Dripping Lava Cave.

The supporting interpretive sites (also shown on the General Development map) include the following (refer to the development concept plan maps in the previous section for a description of the actual development in each area):

Las Ventanas/Sandstone Bluffs

East Rendija area

Braided Cave

El Calderon area

the Zuni-Acoma Trail

the Narrows

entrance/orientation kiosk along NM 117

The following discussion describes the interpretation that will complement the development/facilities/trails described in the previous "Visitor Facilities/Development" section. In other words, it is the intent of this section to describe what visitors will see, learn, and experience after the plan is implemented. It should be noted that the planning and design for all interpretive media for the monument (described in this section and in appendix F) and the conservation area will be professionally done, coordinated between the Bureau of Land Management and the Park Service, and similar in appearance throughout El Malpais. American Indians will be fully involved in the development of interpretive messages that are related to them. Public education in visitor centers and through other media will carry messages to help reduce damage to cultural and natural resources, including delicate geologic features. Interpretation will also cover the monument's impact managment program (described later in this document), especially those aspects of visitor activites that damage the resources.

Parts of this section stress how the needs of local American Indian groups will be met at El Malpais. However, there is another role Indians will play in the national monument. Indians are among the visitors who will come to El Malpais to tour the visitor centers and see the features along the trails. Some will be from the local area, and others from more distant places. Interpretation of the cultural landscape through the eyes of American Indians should be interesting to everyone. It is important that this theme be interpreted well at El Malpais, in an accurate and inspiring way so that people of Indian ancestry will enjoy the resources and feel encouraged to recommend how to improve the interpretive programs.

Multiagency Center, Grants

Signs. Interstate 40, a major cross-country route, parallels the northern boundary of the national monument/conservation area. I-40 actually bisects one of the northernmost lobes of the McCartys lava flow, but exposes a mere fringe of the total volcanic landscape. Few travelers realize that this small area of volcanic rock is only a sample of spectacular lava flows that extend southward for another 35 miles. Most interstate travelers have no idea that they are passing a unique opportunity.

For many, the first contact with the national monument and conservation area will be the interstate signs (both east and west of Grants) identifying the exit for the multiagency center. These interstate signs will most likely identify El Malpais National Monument/National Conservation Area and contain the name of the multiagency center. Because the terms El Malpais and badlands have no direct correlation to volcanism, it is necessary that either the name of the multiagency center and/or additional descriptive phrases be

used on these interstate signs to convey the true identity of this resource – a volcanic landscape.

Interpretation - What Visitors Will See and Learn at the Multiagency Center.[7] Details about interpretation at the multiagency center, such as exhibits, audiovisual (AV) media, etc., are in appendix F; however, an overview of interpretive objectives of the facility is provided below. The functions and size of the multiagency center (described in the "Visitor Facilities/Development Plan" section and in appendix F) will not be repeated here.

The new multiagency center for El Malpais will serve dual purposes. It will be a travelers' information and orientation center, providing visitors with information on areas of interest in the region. Such information will encompass El Malpais National Monument/National Conservation Area and western New Mexico (areas within an easy drive of the Grants/Milan area). The other purpose will be dissemination of Masau Trail information to interstate highway travelers. (As described previously, the Masau Trail is a vehicular tour route along existing roads that links prehistoric and historic cultural sites in New Mexico and eastern Arizona.) The multiagency center and its interpretive media will serve as the central point for the Masau Trail, an integrative approach to interpreting and awakening visitors to the prehistory and history of part of the Southwest. The center will not be a "destination" interpretive facility; rather it will provide "stage-setting" interpretation and information and entice visitors to go see the outstanding resources of El Malpais, the region, and the Masau Trail for themselves.

The key to fitting this large and diverse amount of information into a single visitor service facility is brevity – exhibits will be limited to primary themes. Some of the exhibits will be designed to arouse interest and motivate travelers to visit El Malpais National Monument/National Conservation Area and other nearby U.S. Forest Service, state, and American Indian sites. Other exhibits will pertain to the Masau Trail, giving travelers an idea of what to see along the trail and where the areas are in relation to the center. These exhibits will not tell the visitor so much about any of the areas that they will not want to see them firsthand.

The exhibit area in the visitor center will deal with two generic but interrelated themes – the changing landscapes and environments of the region and the human record of occupation from the prehistoric Anasazi cultures to the contemporary American Indians. Concentrating on these broad themes will convey a central interpretive message about the cultural landscape that is highly relevant to the resources of El Malpais and the local region as well as those of the Masau Trail.

Between the reception area and the trip planning/exhibit areas, large topographic relief models or graphics will depict the El Malpais lava fields (designed to show geological components) and the larger region (designed to orient visitors and interest them in traveling to the various sites depicted).

There will be exhibits about the land – for example rock samples that help visitors identify the various types of features associated with the landscape, coupled with an AV unit or photographs that place the samples in context with the environments they came from. There will be other exhibits (artifacts, photographs, and graphic materials) about people associated with the land. These exhibits will help visitors learn about the American Indian cultures that have occupied the area for more than 1,000 years and provide a reference to events that were happening in other parts of the world during the same time. One exhibit will show current Indian reservation boundaries compared with earlier territories. An alcove in the exhibit area will present another video program that deals with the relationships, feelings, and understandings of the different peoples for this land – this special place, El Malpais. This video will be very specific to the El Malpais area and will perhaps identify some of the features of the landscape while presenting a

7. The following discussion of the center is based in part on the results of interagency workgroups that were held in New Mexico during October and December of 1988 (summaries of these workgroups can be found in the draft *General Management Plan/Environmental Assessment/Wilderness Suitablity Study*) and also on meetings with representatives of the National Park Service, Bureau of Land Management, and the Acoma, Ramah Navajo, and Zuni Indian tribes.

number of different speakers – for example members of the Acoma, Laguna, Ramah, and Zuni tribes, and representatives of the Park Service and the Bureau of Land Management – discussing what they see, feel, and value about the land. The objective of this video will not be to teach the differing philosophies or beliefs of the different peoples (an objective at the Bandera visitor center – described below); rather the objective at the multiagency center will be to point out that there are differences and that we should respect others' viewpoints as well as the land and shared resources. This video will interest visitors in seeing and learning more about this special place and the people who love and respect it.

A 15- to 20-minute interpretive film about the Masau Trail will be produced for showing in the AV theater. The film will emphasize the traditions of the Puebloan culture, including its contemporary descendants and prehistoric Pueblo cultures that are geographically within the Masau Trail region.

Bandera Crater Area

Bandera Visitor Center. The Bandera visitor center will be the primary interpretive facility for the national monument. This center also has an important cross-cultural and trans-time story to relate. More details about interpretation at the center, such as exhibits, wayside exhibits, and AV media, are in appendix F; however, an overview of interpretive objectives of the facility is provided below. The functions and size of the center, described in the previous "Visitor Facilities/ Development Plan" section and in appendix F, will not be repeated here.

The AV presentation will be the focus of interpretation at the visitor center, its purpose being to convey the message that El Malpais is a special place and why and to present the relationship between American Indians and the land. The rugged landscape will be portrayed as a cultural landscape[8] where the land and culture are related. The messages will instill in the visitor a feeling for the landscape and the American Indian people who occupy and still rely on it. The AV will provide a window into the "world view" of other cultures and, if successful, will build respect for each other and encourage everyone to recognize land values in a different light.

There will be an exhibit area that complements the AV presentation by highlighting specific aspects of the cultural landscape. Some exhibits will emphasize the evolution and sequence of landforms – both the lava flows and the sandstone formations. Another exhibit will present some of the unusual ecological adaptations of the flora and fauna, including the bats, kipukas, inverted life zones, faunal and floral diversity, and dwarf forests. Another exhibit will highlight past and present cultures that have had contact with or been influenced by El Malpais' landscape, including the post-Chacoan culture, various European cultures, and contemporary American Indian cultures that have direct ties to El Malpais.

Once visitors leave the Bandera visitor center, many will choose to visit the Ice Cave and Bandera Crater. These two features have long been recognized as primary tourist attractions. Visitors will reach these two features along a one-way park road (designed for low speed) that reveals the aesthetic qualities of the landscape through which it passes. For many this road will provide an opportunity to slow down and leave the rush of civilization behind and will serve to heighten anticipation for the experiences to come.

Dripping Lava Cave/Lava Crater. The trading post, the Ice Cave, and Bandera Crater will be the primary destinations for most visitors; however, visitors who choose can make one stop before reaching these features. A parking area, trailhead, and trail will provide access to Dripping Lava Cave and Lava Crater. An orientation/safety wayside at the trailhead will ensure that visitors are prepared for the experience. A .6-mile trail will lead to the entrance of Dripping Lava Cave. A wayside exhibit at the mouth of the cave will describe how this 2,000-foot-long lava tube cave was formed and

8. A cultural landscape is a geographic area containing both cultural and natural resources characterized by use by contemporary peoples, including subsistence hunting and gathering, religious or sacred ceremonies, and other traditional uses. See the cultural landscape discussion in "The Plan for Cultural Resources Management" section of this document.

help visitors anticipate a few of the features found inside. Catwalk-like steps will provide safe access to the cave floor, and a well-engineered trail will provide access along the length of this enormous underground chamber. For visitors who plan to stay at El Malpais only a short time, this may be their only opportunity to see what it is like in a world of subterranean darkness. Dripping lava formations, ice-water lakes, an immense overhead dome, and other flow formations will all contribute to this unusual cave experience. Visitors will be provided with lanterns or flashlights for their visit into the cave.

Another segment of the surface trail will lead to Lava Crater. The trail to the crater rim will be routed to take advantage of views. A wayside exhibit, if appropriate at the trailhead, will contrast this crater to the other types of craters found in El Malpais, describe how the craters were formed, and present any significant themes or symbolism associated with these types of landforms.

Historic Trading Post Complex. The existing historic trading post complex will be adaptively used as a staging area and trailhead for Bandera Crater, the Ice Cave, and the lava surface features trail (described below). The trading post building, other structures that contribute to its historic significance, and selected artifacts will be retained to maintain a historic scene reminiscent of early pioneering efforts in tourism. (The Park Service may acquire selected cultural artifacts currently on display at the trading post. These objects may be used for display here or in exhibits at the multiagency center or Bandera visitor center.) One of the cabins will be stabilized, fitted with period furnishings (using existing furnishings to the extent possible), and interpreted as an example of an early-day tourist cabin. A wayside exhibit will be used to interpret the historic scene and highlight themes associated with the site, allowing today's visitors to contrast themselves with tourists of yesteryear. Any new development, such as wheelchair-accessible trails, will avoid intruding on the historic scene and blend architecturally with the rustic surroundings. A new 37-car parking area and picnic tables will be provided just east of the trading post.

A portion of the trading post building, designed to function with or without staff, will provide orientation and information to help visitors select trails. A map or graphic exhibit will show the trails and identify lengths, difficulty, time requirements, special features associated with each trail, and any necessary safety information. A small cooperating association sales space (separate and securable when staff are not available) will provide visitors who did not stop at the visitor center a chance to obtain interpretive publications. Interpretive pamphlets and other materials will be distributed.

The remaining portion of the trading post will provide meeting space for special groups on a reservation basis. This space will be set up as a nature center workshop room. For example, school groups will use this space for pre-trip orientation and interpretive presentations.

Ice Cave/Lava Surface Features Trail. Two modern trails (both wheelchair accessible) will start from the trading post – one to the Ice Cave and the other to the lava surface features that are near the beginning of the trail to Bandera Crater (refer to the Bandera Crater Area DCP for orientation to the trails described below). A new stairway will be built for entry to the Ice Cave, and a special platform will allow wheelchair visitors and others who are unable to manage stairs to see the ice. A wayside exhibit will highlight the process that formed this cave and its ice features and explain how the ice maintains itself through the summer; the exhibits will also explain the significance of ice caves to humans, focusing both on prehistorical and historical uses of this important source of water.

A short .5-mile lava surface features trail (wheelchair accessible) will offer visitors a special experience in lava terrain. This trail will include aa and pahoehoe lava, a spattercone, lava cast tree molds, and a cinder landscape. A wayside exhibit will describe the formation and significance of these volcanic features.

Bandera Crater Trail. The Bandera Crater trail (part of the old motor route) will continue beyond the lava surface features trail and lead to Bandera Crater. A connector trail (also part of the old motor tour route) to Bandera Crater will also originate from near the Ice Cave. A wayside exhibit for the crater will show visitors how violent explosions and eruptions created this crater and adjacent lava canyon. One wayside exhibit will focus on the breached south wall of the crater and the upper visible portion of the 16-mile lava tube system that starts at the crater. Another wayside exhibit at a new inner crater overlook platform will dramatize the view of the interior of the monument's best-

known cinder crater. Unlike most craters in the area, the inner portion of Bandera Crater is much deeper (200 feet) than the terrain around its base.

A wayside exhibit will also be used to interpret selected features along the two trails to Bandera Crater. Blocky lava, pahoehoe plates, picturesque trees in twisted and contorted shapes, collapse features, and prehistoric circular rock walls are just a few of the features that will be interpreted. Two short spur trails, with wayside exhibits, may also be constructed depending on the environmental suitability of the sites. One trail would lead to Coffin Tube (a surface lava tube with an unusual rectangular profile) and another to Lichen Sink (a 75-foot deep collapse structure with an ice-water spring and colorful mosses, lichens, and algae growing at the entrance). If visitor access to Coffin Tube and Lichen Sink is determined environmentally suitable, these features may alternatively be included as part of ranger-guided walks in the Bandera area.

Spattercone Valley Trail. This 1.3-mile trail, which is rich in volcanic features, will begin from the Ice Cave trail a short distance from the trading post. An orientation/safety wayside exhibit with a self-guiding interpretive publication covering the Spattercone Valley trail and the connector trail to Cerro Bandera (described below) will be provided at trailheads and at the trading post to ensure that visitors are prepared for the experience. Visitors should be aware that walking is difficult on this tortuous up-and-down volcanic terrain. The Spattercone Valley trail will cross one of the more jagged lava flows in El Malpais, and visitors should feel secure about where they are on the trail. The visitor experience will be like walking on the moon or being lost in a sea of lava. Spattercone Valley will be the primary destination, where visitors will see several large spattercones, including the 40-foot-high Exquisite Cone. Although the self-guiding publication will answer a few of the obvious questions about how these features were formed, it will also convey a broader ecological message of how plants, animals, and humans have adapted to this most unusual landscape. Features that may be considered for interpretation include Hidden, Lava Bubble, and Picture Window sinks; Indian Water collapse and ice cave; and Perfect Circle, Little Rattler, and Hanging Fern collapses.

From Exquisite Cone, visitors will return on the same trail or continue on to the intersection of the Sandstone Ridge connector trail. From there visitors can take a .8-mile trail to Sandstone Ridge or go back to the trading post on the 1.1-mile Spattercone Valley connector trail that parallels the tour road.

Cerro Bandera Connector Trail. This 1.1-mile trail will connect the Ice Cave with the trailhead to the Cerro Bandera summit trail. An orientation/safety wayside with a self-guiding interpretive trail publication will be provided at the beginning of the trail to ensure that visitors are prepared for the experience. The publication (which also covers the Spattercone Valley trail) will interpret the surface lava tubes along the connector trail to Cerro Bandera, as well as other cultural and natural features. (Vehicular access to the parking area and trailhead and the trail to Cerro Bandera summit are described below under the East Rendija area.)

East Rendija Area

The realigned Route 42 gravel road will provide vehicular access from NM 53 to the East Rendija area trailhead (see East Rendija Area DCP). Prior to reaching the East Rendija trailhead, access to the Cerro Bandera trailhead will be provided by way of a short spur road. The steep 1-mile Cerro Bandera trail will take visitors to the highest point in the national monument. From this commanding view, visitors can see hundreds of square miles of the El Malpais region, including the Zuni Uplift, Mt. Taylor, the breached cone and massive flow from Bandera Crater, the historic trading post complex, Sandstone Bluffs, McCartys Valley, Cerro Rendija, the Chain of Craters cinder cones, the Sawtooth Mountains, Cebollita Mesa, and the sandstone cliffs near Ramah. Interpretation for the Cerro Bandera trail and summit area will be included in a trail guide, possibly combined with interpretive literature for the larger East Rendija area. The publication will orient visitors to the most prominent geographic features and place them in context with the regional geologic story. It will also use the world view of other cultures to portray the same geographic features in the context of symbolism or legend (with full involvement of local Indian groups).

Visitors on the new road will also be encouraged to stop at the roadside pulloff at the lava wall trailhead before reaching East Rendija. An orientation/safety wayside will prepare visitors for the experience. A short loop trail will begin at the parking lot and skirt

the edge of this impressive 70-foot wall of lava. A self-guiding interpretive trail publication for the East Rendija area, including the lava wall, will be available at the trailhead and include some of the basic information about the flow's origin, age, boundaries, composition, and dimensions. The contrast of vegetation on and adjacent to the lava will also be discussed.

The East Rendija trailhead will be the final stop for visitors on the new road. An orientation/safety wayside and a self-guiding interpretive publication at the trailhead will ensure that visitors are prepared for the experience. The publication will interpret cultural and natural features along the trail, but will focus on two of the monument's most spectacular lava tubes – Four-Window and Big Skylight caves.

Inside Four-Window Cave visitors will see the darkness being penetrated by light from above. This cave is over 900 feet long and has about a 50-foot ceiling with four skylights. The first portion of the cave trail will cross a rugged lava floor surrounded by jagged lava walls. In contrast, the middle portion has smooth walls and flat floors that twist and wind like a subway tunnel for 400 feet. The view back to the mouth of the cave and to the skylights is unforgettable. Visitors can look through these four openings for a dramatic view of the sky, clouds, and overhanging trees. An equally spectacular encounter of the stacked tube system lies ahead for those who care to venture even farther into this cave. The publication for East Rendija will interpret these interesting features, but for many the cave may be more of an inspirational experience. Imagination and interpretation may combine to make visitors wonder how other cultures may have viewed these natural phenomena.

Big Skylight Cave, which will also be entered by a trail, has a 30-foot circular skylight that allows an impressive view from below or from the trail above. This cave also has "bathtub" rings on the cave walls, which are associated with the falling levels of lava that flowed down the tube.

The trail to Four-Window and Big Skylight caves will offer various cultural and natural features to arouse the visitor's interest. The self-guiding publication for East Rendija will also identify Caterpillar Collapse (a large winding collapse feature overwhelmed by streams of aa lava) and Seven Bridges (a long lava tube collapse where narrow spans of the former ceilings remain, forming seven natural bridges across the collapsed zone). In consultation with American Indians, various types of prehistoric structures may be interpreted to show the relationship between this lava terrain and the native people, both past and present.

Braided Cave

The existing high-clearance primitive road will continue south from East Rendija to Braided Cave. A small dirt parking area, trailhead, and .4-mile primitive trail will provide the more adventuresome an opportunity to hike to one of the longer tubes in the monument. The crisscrossing system of rejoining tubes provides many opportunities for visitors to explore and discover for themselves. A self-guiding publication for East Rendija will also interpret the Braided Cave area, emphasizing those flows and features – such as the deposits of black sand within the tubes – that are prominent in the Braided Cave area.

El Calderon Area

From a new parking area and trailhead along the improved access road in the area, a trail will lead to the entrance of Junction Cave. An orientation/safety wayside at the trailhead will prepare visitors for the cave experience, but visitors will be on their own to explore and discover. Junction Cave may receive a lot of use during the winter months when snow restricts access to Dripping Lava Cave and East Rendija.

Bat Cave will command most of the attention in the El Calderon area during summer months. Evening bat flights will continue to attract local residents and expected increases in regional and national visitors. A new .3-mile trail starting at a new parking area will lead to a small informal viewing area set back from the mouth of the cave. An orientation/ safety wayside at the trailhead will prepare visitors for the experience. Because the bat flights start at dusk, a well-defined trail will be required to ensure visitors a safe return to their cars. NPS regulations will prohibit entry into Bat Cave, and the layout and design of the trail and viewing area will also discourage cave entry. A wayside exhibit near the viewing area will use photography and/or artwork to give visitors a close-up image of these small creatures. The numbers of bats, what they do,

where they go, and the role these lava caves play in their life cycle are questions that will be answered.

Explanations of the visitor health issues and possible damage to the bat population will also be provided to discourage visitors from entering the Bat Cave.

El Calderon is a dominant volcanic peak that is visible from the Bat Cave trail. A wayside exhibit will be used to interpret this cinder cone and its associated collapsed and intact tubes that wind for miles. El Caldron will also be identified as the source of older flows in this portion of the monument.

A second short trail, also starting at the new Bat Cave parking area, will lead visitors to Double Sinks. Visitors who use this trail may be surprised when two large circular holes (one about 30 feet across and one about 90 feet across, both 60 feet deep) appear unexpectedly in the earth's surface. These two collapse structures will provide startling evidence that molten lava once flowed here. A wayside exhibit will be used to explain these two features and their microclimates. Lush ferns and mosses decorate the bottom of these two cavities. The abundance of such microclimates in this lava environment has created habitats for some of the 75 species of mosses and lichen that have been identified in the monument. The short trail between Double Sinks and Junction Cave will be a link between all three features and provide visitors with choices for short or longer hikes in the area.

Zuni-Acoma/Acoma-Zuni Trail

The existing gravel entrance road will provide access to the west end of the trail from NM 53. The existing trail to a nearby trailhead overlook will be surfaced for wheelchair access. An orientation/ safety wayside exhibit will be placed at the trailhead overlook. At the overlook visitors will visualize the general easterly direction of the trail across the flows. Another wayside will interpret the prehistoric rock structures near the overlook that served as bridges to span a small chasm.

A wayside exhibit will show how this trail relates to other early trails in the region, highlighting that portion of the trail that crosses El Malpais. Visitors should know something about the prehistoric and historic travelers who crossed this rugged badlands. Part of the wayside exhibit will touch on western expansion and the various expeditions that crossed or bypassed El Malpais in search of a better route west, including the Dominquez-Escalante expedition. A self-guiding publication for the Zuni-Acoma trail will provide a brief, general history of the trail. The publication will weave both the natural and cultural features found along the trail into a story of use that spans at least 1,000 years.

A small parking area, trailhead, and trail will be provided adjacent to NM 117 for the east end of the trail. A wayside exhibit and the same self-guiding publication just described will provide information for this end of the trail.

Las Ventanas

A 1.7-mile paved road from NM 117 will provide access to Sandstone Bluffs overlook. Once on this road, visitors will be able to take a short spur road to the Las Ventanas trailhead/parking area. A wayside exhibit at the new trailhead/parking area will explain the importance of the entire prehistoric Chacoan culture system. A 1.5-mile trail will lead from the trailhead past a viewpoint on the ridge that looks down on a large natural sandstone arch and continues to the Las Ventanas Chacoan site. Spectacular views from this trail will generate numerous questions, some of which will be answered at the arch viewpoint through a wayside exhibit. More importantly, this view is inspiring and suggests the significance of this landscape in the lives of American Indians, both past and present.

The trail will continue to Las Ventanas where visitors see the physical remains of a community that thrived sometime between A.D. 1050 and 1200. Las Ventanas will be identified as a Chacoan outlier, placing it in context with both Chaco Canyon and the other Chaco outliers (more than 70) in the region. After completion of the condition assessment report (see "Visitor Facilities/ Development Plan" section), the NPS Harpers Ferry Center will develop the necessary media recommendations for the site, with full involvement of local American Indians.

Sandstone Bluffs Overlook

The next stop for most visitors will be Sandstone Bluffs overlook. There will be short trails to two overlooks near the rim so visitors can see the landscape and lava from horizon to horizon; a parking area, one trail, and one overlook site will be wheelchair-accessible. These trails and viewpoints will be designed to enhance and not detract from the overlook experience.

This overlook area provides the best panorama of El Malpais, reveals near and distant patterns of an immense lava field, and provides opportunities to interpret a long continuum of human occupancy. Wayside exhibit panels will interpret the McCartys flow as a wide, 35-mile-long stretch of lava that is barren and little weathered or eroded. One exhibit will identify a few of the more prominent features – such as massive plates of pahoehoe lava turned on end, large pressure ridges, the small crater that was the source of the lava flow, the Chain of Craters, and the Zuni Mountains – presenting a few facts about each. In consultation with the American Indians, an adjacent wayside will contrast this more scientific presentation with an alternative view of how other cultures perceive the creation of this landscape.

The Narrows

From the trailhead along NM 117, a .4-mile loop trail will provide the only opportunity along the NM 117 corridor for visitors to experience the spectacular features of the McCartys lava flow firsthand. A portion of the trail will be wheelchair accessible, if possible. An orientation/safety wayside and a self-guiding interpretive publication will be provided at the trailhead to prepare visitors for this short hike onto the lava.

This visitor experience will be like standing in a vast field of freshly cooled lava. Large chunks of pahoehoe lava are chaotically pushed against each other along pressure ridges and in lava sinks. Looking back, visitors will see the dark lava against the light sandstone walls that contained this flow. A self-guiding trail publication will interpret the natural features, including lava squeeze-ups, pressure ridges, pahoehoe lava of different textures, dwarf vegetation, and an unusual stand of aspen.

Roadside Kiosk along NM 117

A small parking area and orientation kiosk will be constructed on NM 117 near the south conservation area boundary. A wayside exhibit will be incorporated into the design to provide orientation, information, and a map with major points of interest. The wayside exhibit will also highlight the resources.

Public Use Reporting

There is very little specific information about visitor use of the monument. These data are important for efficient and effective management. To determine levels and patterns of visitor use throughout the monument, the Park Service will establish a system to collect accurate visitor use data at all developed visitor facilities and to allow for the timely evaluation and reporting of use statistics. In addition, a parallel system will be devised to estimate levels and patterns of backcountry use. These systems will be implemented as soon as possible and will be expanded and adapted as necessary.

It is essential, too, that the statistics collected be designed to serve monument programs that detect and measure visitor impact on resources, including the quality of visitor experience. (See later "Carrying Capacity and Impact Management" section where monitoring and the effects of visitor use are more fully described.)

Recreational Activities

The Bandera visitor center, the scenic overlook pulloffs, and the cultural and natural feature pulloffs along NM 117 and NM 53 are included in the frontcountry. The Bandera Crater area will be the primary destination for most monument visitors. The multiagency center, the Bandera visitor center, and the trails to the Ice Cave, Bandera Crater, and Dripping Lava Cave will dominate the visitor experience for the majority of visitors who stay four hours or less. First-time visitors who have more time to spend, repeat visitors, and those seeking a less developed experience will likely visit the East Rendija area, Sandstone Bluffs overlook, and the Las Ventanas Chacoan site.

Recreational activities will include sight-seeing (vehicular touring), interpretive activities, hiking, spelunking, bird-watching, backpacking,

backcountry camping, vehicular camping, and four-wheel driving. Specific backcountry hiking and backpacking opportunities will be specified in a future backcountry management plan. A brief description of the expected visitor experience relative to the standard of access and interpretation in each subzone is in the earlier section on management zoning (see also appendix C).

Backcountry, Nonmotorized Recreation. A small number of visitors (less than 5 percent) will use the primitive subzone (approximately 109,275 acres), where they can hike cross-country or on primitive trails. Caving will occur on a permit-controlled basis. There will be no facilities and no on-site interpretation, and the emphasis will be on learning independently. Encounters with others will be infrequent or nonexistent, giving visitors the perception of a high degree of self-reliance and the greatest opportunity for solitude.

Backcountry, Motorized Recreation. A small number of visitors will use high-clearance or four-wheel drive vehicles along specified corridors in the semi-primitive subzone (approximately 3,988 acres) where they can access more remote areas within the monument/conservation area. There will be no facilities and little on-site interpretation. A low frequency of encounters with others will give visitors the perception of self-reliance and opportunities for solitude. Access to Braided Cave (in the monument) and Cerro Encierro and Cerritos de Jaspe (in the conservation area) fall within this category.

Frontcountry Sight-seeing. Most visitors will exclusively use the monument development zone (including the developed and rustic subzones and containing approximately 1,186 acres), where they can easily and quickly reach many of the monument's outstanding features by way of paved and gravel roads. Use will be encouraged by facilities such as visitor centers, scenic overlooks, a campground, restrooms and vault toilets, picnic tables, and a variety of interpretive stops and trails. Films, exhibits, demonstrations, and interpretive publications will be available at the two visitor centers. There will be on-site exhibits and/or publications at the major natural and cultural features, and guided interpretive activities will be offered. There will be a moderate to high frequency of encounters with other visitors in the frontcountry. Despite the frequency of encounters, some of the trails may provide opportunities for solitude. The high levels of development and interpretive services will require a relatively low level of self-reliance.

THE PLAN FOR CULTURAL RESOURCES MANAGEMENT

Introduction

It is the Park Service's responsibility to locate and evaluate the significance of the natural and cultural resources in the monument and to provide resource-sensitive management, scientific study, preservation, and interpretation. El Malpais is a new unit of the national park system that contains numerous and complex cultural resources. Because it is a new area, there are major deficiencies in resource inventories, research data, and interpretive information as well as specific directions to deal with numerous other important problems. The Park Service must find ways to keep these resources unimpaired for future generations and provide for American Indian traditional use while managing the resources for the enjoyment of all visitors.

The following plan identifies the major cultural resource issues at El Malpais and recommends future studies and research. It is designed to provide managers and cultural resource specialists with long-term general guidance and a framework from which to make decisions regarding these resources. Guidelines need to allow El Malpais managers discretion in reaching decisions that reflect American Indian preferences while remaining in accord with the law; therefore, only general actions are proposed in this plan. Because of the lack of data, this plan is interim in nature.

Consistent with NPS procedure, a detailed resources management plan (RMP) will be written in the future. Because the cultural and natural resources at El Malpais are inseparable, these resources will be integrated in this detailed RMP. The RMP will be based on expanded resource knowledge and increased experience with the resources. Specific project statements for the monument's RMP can be abstracted directly from the present document. The future RMP will also prioritize necessary projects and management actions so they can be accomplished in an orderly sequence. The RMP will further define the issues, describe ongoing operations and special projects,

state costs and personnel needs, and describe the alternatives and their impacts.

An Overview of This Plan

The cultural resources in El Malpais are of two types, which need to be managed in different ways. The first of these, the prehistoric and historic resources, are nonrenewable. The Park Service has a long history of dealing with these resources and has developed guidelines and policies for their management (which are described later in this plan and in appendix G). According to these guidelines and policies, the Park Service must prescribe specifically how the prehistoric and historic resources are to be managed at El Malpais.

The second type of resource is related to traditional human use. The establishing legislation for El Malpais specifically ensures that Indian peoples have nonexclusive access to monument and conservation area lands for traditional cultural and religious purposes. American Indians whose lands surround El Malpais have a long and deeply felt attachment to this special area. The lava flows and the hills and mountains are part of their creation stories and world view, and American Indian religious and subsistence activities are inseparable from this harsh and beautiful landscape. The significance of this cultural landscape[9] comes from past and present human interaction with and use of the total natural environment. However, these concepts are less familiar to NPS personnel, and there are few guidelines for management. Sensitivity is called for in the ways the Park Service manages the cultural landscape and affects the lives and practices of American Indians.

The Park Service will consult with local Indian peoples to develop mutually acceptable ways to enhance their privacy during religious activities, facilitate their gathering and other subsistence activities, and build a sense of shared responsibility for protection of religious and archeological sites. Ownership of land in legal title by the federal government does not mean that El Malpais does not also belong to Indians in a special "usership" and religious sense. It is inferred in the establishing legislation, and other laws make it clear, that local American Indians are also guardians of El Malpais. Effective consultation between American Indians and NPS staff leading to improved trust is crucial to the future of the national monument and is a basic part of this plan.

The Foundation of the Plan – Laws, Guidelines, and Policies

A number of laws, guidelines, and policies were considered during planning. NPS-28, the "Cultural Resources Management Guidelines" (hereafter referred to as NPS-28), provides basic direction for dealing with cultural resources. The laws and policies seek a balance between the needs of American Indians to use areas of the national park system for traditional activities and management of the resources held in trust for all Americans by the National Park Service. Summaries of the most important cultural resources laws, regulations, proclamations, orders, standards, guidelines, and policies applicable to El Malpais are included as appendix G.

The Cultural Landscape at El Malpais

El Malpais National Monument may be described as a cultural landscape (specifically, it may be an ethnographic cultural landscape[10]) – that is, a geographic area containing both cultural and natural resources that is characterized by use by contemporary peoples, including religious ceremonies, subsistence hunting and gathering, and other traditional activities. (Because criteria that help define a cultural landscape are linked to National Register of Historic Places determinations, El Malpais is actually considered a potential cultural landscape until the area(s) are accepted as national register properties.) The inventory and evaluation of the El Malpais landscape (preceding national

9. A more thorough discussion of a cultural landscape appears later in this plan.

10. There are five kinds of cultural landscapes (not mutually exclusive) – historic scene, historic site, historic designed landscape, historic vernacular landscape, and ethnographic landscape. Definitions can be found in NPS-28, appendix A.

register nomination) will confirm the type or types of cultural landscapes that exist in the national monument.

American Indian Perceptions and Use of the Cultural Landscape. Usually, the most conspicuous elements of a cultural landscape are the human-built and natural environments. At El Malpais, however, one of the most important elements is the special meaning that American Indians ascribe to the entire landscape of the El Malpais as well as to specific landforms, lava flows, plants, and animals. These features are valued by the American Indians as a type of reference point in their religious beliefs and form an inextricable part of their world view, permeating all facets of their culture. The special environment of El Malpais influences human perceptions as well as use of the land and its resources. For example, particular lava features play an important role in American Indian worship. Special plants may grow only in certain places in El Malpais. To take advantage of these scattered resources, American Indians have had to learn the locations and times of year each species should be harvested; they also know the necessary rituals for each place and resource. This special knowledge, evolving over centuries of experience, has been passed from generation to generation. Traditional cultures have a long and enduring relationship with the land and its resources, a relationship that contributes to their sense of place and links the prehistoric past with the ethnographic present.

Contemporary American Indian legends and stories describing the creation of El Malpais make it obvious that the landscape continues to be part of the cultural identity of these peoples. The El Malpais landscape clearly reflects this identity and can come alive to almost anyone who begins to see "it is the human caring about a place that determines its vitality" (NPS Gilbert 1985b, i).

Other groups, such as the Hispanics and ranchers, should not be overlooked in portraying the cultural landscape at El Malpais. Their perceptions reflect culturally diverse views, values, and resource uses that are important to the definition of the cultural landscape.

Changes in the Cultural Landscape. Natural forces continue to shape the landscape, yet El Malpais has retained its essential qualities of immense space, open vistas, and stark contrasts – especially the contrast of black lava rock spreading out below colorful sandstone cliffs and cinder craters.

The landscape has also been altered by humans through occupation and use of the environment. However, other than the roadways skirting the lava flows around the monument's boundaries, few man-made features are obvious to the casual observer. Close examination reveals trails through the lava that link special places for American Indians. Colorful pot sherds and fragments of chipped stone in quiet recesses mark thousands of years of history. Weathered cabins and sagging barbed-wire fences of the historic era also link the land to its past, continuing the human story at El Malpais.

How the Cultural Landscape Will Be Delineated. A future study for El Malpais will specifically define its cultural landscape. This will require the skill and insight of a number of specialists such as park managers, landscape architects, ecologists, historical architects, archeologists, cultural anthropologists and geographers, and representatives of the several cultures to whom El Malpais is important.

Research into the unknowns about this cultural landscape will result in information that is useful to managers. Historical and ethnographic research will first determine who used and still uses the landscape, how it was used, and what the landmarks and boundaries of the landscape may be. This study will help relate visible features and cultural traditions in time and space. In part, ethnographic data collection and research in the monument will be guided by and a component of the cultural landscape study. Archeological investigations will further define boundaries, describe resources, and help refine the historic and prehistoric themes and contexts associated with El Malpais' cultural landscape.

Identification of human use patterns and architectural design (including the vernacular) will be a part of the process. The presence and impacts of monument visitors will also be considered. The identification of natural features will be especially important, because the landforms and distribution of water, vegetation, and animals heavily influence human use. Data on the natural and cultural features will help in understanding the condition of all the resources and help delineate the landscape.

The cultural landscape study will also evaluate the landscape and its resources for national register purposes, and nomination(s) will be prepared as applicable. In this study, none of the types of resources – cultural, ethnographic, or natural – should assume primacy; instead, the study will be a holistic, synergistic product.

In recognition of the significance of this cultural landscape to contemporary American Indian groups, and to heighten awareness among other monument users, Indian names will also be used to identify landmarks wherever appropriate. Naming will be part of a cooperative effort with American Indians so that approved common tribal names are used for these features; special consideration may be needed for features named by more than one tribe.

Guided by the cultural landscape study, managers may prescribe additional actions, including scientific research, stabilization and/or preservation of significant resources, specific protection strategies, and interpretation. The landscape study should have high priority for completion to guide management decisions, especially those related to development and concerns of the Indians.

Protecting American Indian Religious Freedom

The American Indian Religious Freedom Act provides for the preservation of Indian rights to practice their traditional beliefs; it also provides for consultation with Indian groups in planning and management activities that affect them. To fully comply with this act, the basic tenets of American Indian religions must be understood. For example, American Indian groups usually do not make a distinction between the secular and the sacred. Their religion is an inextricable part of their lives, integrated into all other traditional aspects of their culture. Places of worship and veneration may be natural features – mountains, springs, and lava flows. American Indian religious practices are usually the secret and exclusive province of a particular practitioner and are shared only in prescribed ways with certain specified individuals having particular relationships with the practitioner.[11] Holders of traditional Indian beliefs may even feel that misfortune may come to those who share this information with inappropriate parties. Even knowledge that is not considered secret is likely to be private to the native community. Elderly tribal practitioners may hesitate to speak because they are not well acquainted with the English language, or they may remember past legacies of reprisal for traditional religious practices.

The Park Service will develop and accomplish its programs in a way that reflects respect for the religious beliefs, traditions, and other cultural values of the Indian tribes who have ancestral ties to El Malpais and its resources. The Park Service will strive to ensure privacy for American Indians to pursue their religious activities without interference or inappropriate observation by curious visitors who want to learn of Indians' special ways. This will be accomplished by designation of some public use areas as day-use only and by short-term to permanent closure of specified portions of the monument to the general public. The establishing legislation for El Malpais states that the governor of the Pueblo of Acoma and the chief executive officers of other Indian tribes should make recommendations on methods of ensuring access, enhancing the privacy of traditional cultural and religious activities in the monument, and protecting traditional cultural and religious sites (Public Law 100-225, title V, section 507). It is generally the custom of the Park Service to honor the wishes of American Indians regarding religious activities. NPS training programs will cover the etiquette to be followed when NPS personnel encounter religious activities or religious sites and offerings.

Subsistence Uses at El Malpais

Traditional use in the monument is not currently perceived as a major problem by the Park Service. The El Malpais cultural landscape is the product of centuries of traditional use by American Indians and others. The existing condition of these lands and resources represents a balance achieved through long interaction between humans and the environment. Continuation of the present low level of use poses no additional significant threat to

11. Adapted from Advisory Council on Historic Preservation's "Draft Guidelines for Consideration of Traditional Cultural Values in Historic Preservation Review," August 1, 1985, p. 9.

resources. In fact provision for continued traditional patterns of use will probably help maintain the cultural landscape.

Trespass

Visitors may accidentally enter Indian lands while exploring monument lands and unthinkingly intrude upon private religious activities, remove objects of religious significance, or trespass on lands used for grazing and other purposes. Measures to prevent these problems will include signs, fencing, interpretive pamphlets and messages in visitor centers, and routine ranger patrols.

Improving Communication between American Indians and the Park Service

Federal managers sometimes lack a good working knowledge of the etiquette to observe in talking with Indians. Ignorance of this etiquette may unintentionally offend tribal members and lead to poor communication. For example, managers should not assume that a lack of response from Indian tribes regarding federal proposals indicates no objection to or no interest in the project. The opposite is often true. Because of the egalitarian nature of the decision-making process in some tribes, the opinions of the entire group are sought and weighed before any decision is made. For groups like the Navajo, who live in dispersed homes scattered across large land areas, this means a lengthy process of notification and consultation. Religious matters may be referred to tribal religious leaders, a process which often cannot be accomplished within the short time frames imposed by planning. Meetings should be designed so that location, etiquette, and subjects are meaningful to the groups involved.

Because of good opportunities for a shared approach in identifying the cultural values that will make El Malpais special to visitors, it is especially important for Indian/government interactions to be effective. Communications with American Indians will be routine and forthright, and Indian interests will be given the fullest possible consideration by the Park Service.

Indian tribes differ in their concerns and their feelings about sharing information on subsistence and religious activities or the treatment of human burials and sacred artifacts. For this reason, the research studies described above and later and that are itemized in appendix H will be conducted by qualified professionals who are attentive to concerns of the American Indians. In addition, the Park Service will work with the concerned American Indian groups to develop sensitivity training programs for monument employees and volunteers.[12] Consultation with American Indian groups begun as part of the general management plan planning process will continue in the future, helping to improve understanding and achieve common goals.

Research, Documentation, and Evaluation of Cultural Resources

The cultural resources of El Malpais National Monument include sites, objects, and structures ranging in age from the present to as much as 10,000 years ago, each with differing levels of significance, integrity, and need for protection. A brief description of the types of sites and their significance, condition, and use is found in the "Affected Environment" section of the draft plan.

Prehistoric and Historic Resources. Primary among the cultural resource issues at El Malpais is the lack of knowledge about these resources. Much of the past survey work was limited to small areas and was biased or inaccurate. Past surveys have covered only about 1.3 percent of the monument, and most of these surveys have been in areas away from the lava – adjacent to roadways and along the eastern boundary of the monument. Many surveys have been conducted to obtain compliance

12. An excellent start has been made in sensitivity training through the efforts of the Ramah Navajo. Also, an informal nonfunded Native American Consultation Committee has been established to improve communication among native Americans who are culturally linked to El Malpais, the National Park Service, and the Bureau of Land Management. This committee will meet periodically in the Grants area to discuss issues and concerns that may affect the preservation and interpretation of native American cultural heritage as well as NPS/BLM operational planning for El Malpais.

for development and have not focused on scientific research. Only a few formal site-specific archeological excavations have been conducted. Many of these have been in areas where large prehistoric structures are visible, an approach that omits whole classes of sites and gives an unbalanced, inaccurate picture of the monument's cultural resource base. Much of the data is also old and was accumulated before modern dating technologies.

In turn, these data insufficiencies preclude efficient management decisions and severely limit prescriptions for treatment and preservation at this time. The lack of knowledge about area resources and their significance does not allow proper comparison of the importance and condition of one site relative to another. It also does not allow assessment of the place El Malpais resources occupy in a larger regional perspective; decisions about which sites to inventory and preserve untouched for future scientific research; and decisions about land acquisition priorities. Without knowledge about the location, significance, and integrity of sites, including the extent of deterioration, the monument staff cannot provide optimal protection and establish priorities for expenditure of time and money. Because there are numerous cultural sites in the few areas of the monument that have been surveyed, the Park Service expects to find many additional sites through future surveys.

Various plans and studies necessary to guide identification, study, treatment, interpretation, use, preservation, and management of the monument's cultural resources are outlined in appendix H. An integrated resources management plan will have high priority. Other plans needed include a research plan (as described in appendix I) to generate and express the rationale behind proposed future scientific inquiry, and an archeological overview and assessment to review, summarize, and evaluate existing archeological data. An archeological evaluation study is needed to determine eligibility of known properties for the National Register of Historic Places. Combined archeological identification and evaluation studies will help define the cultural landscape at El Malpais and, on a long-term basis, will identify and help protect archeological sites. Cultural resource surveys will be synchronized with the natural resource surveys to take advantage of a broad range of professional disciplines and delineate the associations between the two types of resources wherever possible. Other plans and studies needed to guide resource management and potential development are itemized in appendix H. NPS-28 guidelines will be followed in developing standardized information about archeological sites, and information will be in a format that will integrate easily into state-of-the-art data bases (such as the one developed by the Museum of New Mexico's Laboratory of Anthropology). Data regarding the cultural context and location of cultural resources will be withheld from public disclosure according to law.

Archeological investigation, data recovery, and protection can benefit American Indians by preserving elements of their past history and culture and identifying their associations with prehistoric cultures. American Indians, however, may view archeological investigations of prehistoric sites as desecration rather than scientific inquiry. On the other hand, the Park Service has a legal responsibility to be accountable for archeological and other artifactual materials, a responsibility that cannot be arbitrarily dismissed. To effectively manage, the Park Service is also legally responsible to inventory cultural resources and evaluate their national register significance – it is virtually impossible to protect an unknown cultural resource.

Consultation with concerned local American Indians will precede archeological work, and all possible measures will be taken to resolve differences between Indian tribes and federal managers reasonably so that NPS plans and actions respect the cultural context of sites, including those that are ethnographic. Involving American Indians through consultation can help build trust. The Navajo and Zuni tribes have had successful archeological programs in which archeologists and American Indians worked together to document sites. The U.S. Forest Service has helped develop para-archeology programs involving American Indians. Similar programs may be effective at El Malpais. American Indians can also play important roles as volunteers in observing and reporting evidences of pot-hunting, vandalism, and disturbance of sacred places. Communication about illegal activities will alert managers to the need for stronger or different protection measures.

Burials and sacred objects will be afforded the utmost respect, and the Park Service will consult

with American Indians concerning remains associated with these groups (1988 NPS *Management Policies* 5:13). El Malpais managers will establish a prompt and effective notification system to contact and consult with concerned groups. Some of the Indian tribes who traditionally use El Malpais have developed different policies for dealing with the exhumation, study, and reburial of human remains, and federal managers will deal with burials on a case-by-case basis, with an informed awareness of tribal concerns and following procedures outlined in NPS-28 (Technical Supplement 7) and in the 1988 NPS *Management Policies* (5:13).

There is no easy way to determine when prehistoric sites and artifacts with long human use continuing to the present time are to be treated under the American Indian Religious Freedom Act, when these materials should more properly be handled as archeological materials subject to the Archeological Resources Protection Act and the related legislation, or when all these guidelines should apply. Therefore, discovery of significant cultural resources will be followed by protective measures. The Park Service will ensure that proper care and respect are accorded any sacred sites or objects encountered by consulting with American Indian groups who have an interest in these resources.[13]

Ethnographic Research and Data. The Park Service needs ethnographic information to manage El Malpais effectively and with regard for American Indians. Because much of the available data is out of date and incomplete, it is inadequate for describing contemporary peoples.

Some tribes recognize that ethnographic research can enrich their own historical knowledge and serve to record and hold onto traditional practices and beliefs that are being lost from their culture. American Indians will have access to the ethnographic information about them, and ongoing involvement will ensure accuracy, respect for American Indian culture, and relevance to the cultural practices that American Indians feel must be protected.

Holmes' study (1989) will be augmented by additional components of the overall ethnographic program including a traditional use study (done in correlation with the cultural landscape study) and an ethnographic resources inventory.[14] The traditional use study is especially important with regard to development of the monument's fire and vegetation management plans because vegetation clearing, wildland fires,[15] and reclaiming and revegetating areas could alter the numbers, types, and distribution of plants or other natural resources traditionally gathered by American Indians. The Park Service will consult with American Indians regarding these concerns and work with them in the timely completion of a traditional use study, which will help guide development of future natural resources plans.

An ethnographic resources inventory, identifying areas of special cultural value to American Indians, is important to development of the cultural landscape study. This inventory, identifying areas of special cultural value to American Indians, will be accomplished to the extent possible, in accord with local Indian values and as they are willing to share information. However, it should be recognized that a complete inventory is not realistically anticipated or information may be general in nature. Resources having traditional cultural values may be a location where American Indian religious practitioners have gone historically and still go to perform ceremonial activities, leaving little trace upon the land. Groups may be reluctant to reveal information that might jeopardize the privacy and effectiveness of their religious or subsistence activities.

In addition, El Malpais establishing legislation provides for protection of the privacy of traditional cultural and religious activities in the monument, consistent with the American Indian Religious Freedom Act. In keeping with the spirit of these laws, some ethnographic resources related to contemporary traditional practices in El Malpais will not be inventoried beyond the minimum level

13. Human burials and grave goods are also discussed in "Managing the Collections" section of this plan for cultural resource management.
14. The Bureau of Land Management plans to continue ethnographic work as funding becomes available.
15. See definition of wildland fire in the "Plan for Natural Resource and Wildlife Management" section.

necessary for management. NPS regulations and policy require that archeological, ethnographic, historical, and other studies of this nature reflect sensitivity to the privacy of community consultants regarding practices, beliefs, and identities. It will also be monument policy that information regarding the location, nature, and cultural context of archeological, historic, and ethnographic resources be exempted from public disclosure (1988 NPS *Management Policies* 5:12, 13).

The Park Service could provide technical assistance to American Indians who would like to record and interpret their own cultural history or be represented in the interpretive programs of the monument. Cooperative ventures with tribes to have them produce up-to-date ethnographic data on the uses of plants and other resources have been successful in other areas. By serving as interpreters, local American Indians would contribute valuable perspectives to the interpretive program. The monument staff will work with the NPS Harpers Ferry Center to evolve appropriate media for the interpretive story.[16]

Evaluation and Compliance. Because traditional ethnographic, ethnohistoric, and prehistoric resources are considered potentially significant for listing on the national register until they are evaluated, development activities will avoid identified cultural resources whenever possible. American Indians will also be consulted when ethnographic or cultural properties of interest to them are involved.

As surveys and evaluations of significance proceed in the years ahead, national register of historic place nomination forms will be prepared.[17] Where strong American Indian concerns make formal nominations of religious sites to the register impracticable, minimal data necessary for site protection will be maintained in secrecy. Results of evaluations will also guide decisions regarding suitability of sites for research, interpretation, and special treatment or protection. Completed history and archeological reports will help document compliance activities and assist later research.

National register properties will have the highest priority for protection and will receive preservation maintenance. Resources identified as a component of the larger cultural landscape will be managed in this broader context.

A List of Classified Structures has not yet been prepared for El Malpais, but will be as soon as practicable. No potentially historic property will be inalterably changed without consultation with the New Mexico State Historic Preservation Office and the Advisory Council on Historic Preservation.

Protection of Cultural Resources

The monument's cultural resources, including American Indian religious and subsistence sites, could be affected by various activities and other conditions. These include general "wear and tear" from concentrated use; site misuse, such as camping or picnicking on identified or unidentified sites; possible loss or destruction of historic fabric from adaptive use of historic structures; inadvertent disturbance of archeological sites from development and maintenance of facilities; vandalism and illegal collection of resources; and degradation by natural forces.

The El Malpais establishing legislation strongly emphasizes the preservation and long-term scientific use of the area's cultural resources. This cannot be accomplished unless sites are protected from threats that would diminish their integrity. Loss of these resources at El Malpais degrades resource quality, destroys scientific information, and deprives visitors of important educational opportunities.

The following discussion proposes some general principles for protecting the monument's cultural resources. The future action plan, the RMP, will draw upon these principles in describing the actions and priorities for specific management projects.

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16. See the "Interpretation" section of this cultural resources plan and the "Visitor Services/Interpretation Plan" section of the document for further discussion of proactive ideas regarding development of ethnographically sensitive interpretation.
17. Resources will be evaluated as outlined in 36 *Code of Federal Regulations* 60. National register forms will be prepared in consultation with the concerned tribe.

Natural Degradation of Sites. Natural processes of wind, water, gravity, fire, expansion of plant roots into sites, and digging by animals have adverse impacts on cultural resources. Cultural and natural resource management will be integrated whenever possible to alleviate this problem; priority sites will be monitored, and erosion control and other mitigating measures will be taken.

Looting and Vandalism. Destruction of finite, nonrenewable cultural resources that are important to the nation's heritage through looting and vandalism is endemic and epidemic in the United States, and it is occurring at an alarming rate. The government's costs for protecting these resources, in terms of personnel and money, is substantial.

While some visitors do not perceive casual collection of such things as pot sherds and projectile points as a major problem, such collecting is illegal and destroys scientific information. Detailed surface documentation, law enforcement, interpretation, and public education programs will be used to help mitigate these impacts of visitor use.

Because looting is a lucrative way of life for some people, it is important to consider that

> Archeological looting and vandalism on public lands are types of illegal, anti-social behavior no different in their basic criminality than other forms of public property theft and defacement. Yet, we have tried to deal with them as if they were unique types of activities and not encompassed by the discipline of criminology (McAllister 1988, 53).

One solution to looting for gain seems to be swift, comprehensive, consistent law enforcement. Increased patrolling by law enforcement officers will be an important deterrent to looting and vandalism at El Malpais. In addition, a monitoring program will be established for sites and areas most vulnerable to human and natural damage. These monitoring and law enforcement programs will be reevaluated periodically to determine their effectiveness. If sites show degradation, additional appropriate protective measures will be promptly adopted. Predictive modeling as already developed (Christensen et. al 1988, 62) will be used to help identify areas with special needs for resource protection until the monument's resource inventories can be completed. The model will identify factors that make sites accessible and visible and the characteristics of the individuals most likely to vandalize or loot sites.

Information about recorded sites and their conditions will be compared to environmental data such as topography, soils, geologic features, and vegetation. The combined data about recorded and postulated sites, vulnerability factors, and environmental conditions will be analyzed to identify areas that may have sensitive resources. Such areas will receive high priority for patrol and archeological investigations, and monitoring programs will be established; the model will be tested against actual site conditions.

Agreements with private landowners, state and federal agencies, and Indian tribes will be sought to increase protection and monitoring capabilities. Law enforcement will be coordinated, and a cooperative law enforcement network will aid in stemming violations.

Archeological Resources Protection Act training courses will be held for all monument employees and volunteers (not just those involved in law enforcement). This training will improve understanding of the types of protected resources; outline successful prosecution methods; help develop new strategies for preventing crimes; and teach damage assessment reporting, case preparation, and ways to improve existing law enforcement efforts.

Informal names of certain shelters and caves in the monument's lava flows are descriptive of features found there – "Ash Chamber Cave," "Cairn Cave," etc. Unfortunately these names tend to identify areas where cultural resources are or were once found, give the impression that such resources are present, and may increase vandalism. Care will be taken in the preparation of exhibits and publications to avoid this problem.

Effects of Development. Surveys of development areas will precede final comprehensive design so that construction will avoid known sites. However, construction of buildings, campsites, sewage facilities, leachfields, parking areas, trailheads, trails, and roads could destroy unknown archeological resources. Construction activities will disturb and compact soils, which can alter the horizontal and vertical distribution of buried archeological remains, thereby damaging artifacts

and the contextual environment of sites. Prior to any earth-disturbing activities, a professional archeologist will inspect the ground surface for prehistoric or historic remains. If any previously unrecorded resources are found, additional investigations, data retrieval, and evaluation of significance will be completed and mitigations prescribed before actions begin. As questions about mitigating measures arise, they will be resolved in consultation among the Park Service, the Advisory Council, the New Mexico State Historic Preservation Office, and concerned American Indian tribes.

Archeologists will monitor construction in areas where subsurface remains are likely. Where feasible, trail and road alignments will be shifted to avoid archeological resources; otherwise, sampling/collecting/testing procedures will be followed. Priorities for archeological investigations will depend largely on the sequence of development, the amount of existing data, and the potential threat to significant sites; work will also relate to the research plan discussed in appendix I. However, Las Ventanas/Sandstone Bluffs and the Bandera Crater areas will be the top two priorities for intensive survey and documentation because of the high potential of additional sites in these areas.

Wherever feasible, existing historic structures will be adaptively reused in lieu of new construction as required by section 110 of the National Historic Preservation Act. Treatment of these structures will be guided by applicable NPS policies. To avoid improper structural modifications that may diminish the integrity and significance of historic structures and sites, specific preservation plans for the monument (historic structures reports and preservation guides, research plans, etc.) will be developed and conform to the secretary of interior's standards for rehabilitation. These plans will help avoid the serious cumulative impacts that a series of small unrelated projects would have on the total resource over time.

Stabilization and maintenance of prehistoric structures will follow similar preservation standards. The physical properties of original building materials and construction techniques will be documented archeologically and/or architecturally prior to stabilization activities, and preservation plans and guides will be developed for their future care.

At all monument development areas, design will be compatible with the cultural landscape, respecting the original landform. American Indians will be consulted prior to design of roads, trails, and facilities throughout the monument, and their advice will also be sought on appropriate means of protection for important resources. The monument staff, in consultation with American Indian groups, will find solutions to potential conflicts between visitor use, trespass, and Indian traditional uses. Provision will be made to avoid construction and public use during primary periods of religious activity. Most religious use in the vicinity of Bandera Crater will likely occur in winter when there are few visitors. The superintendent and concerned American Indians will work out this closure and others to protect privacy.

Design of facilities will provide the highest feasible level of physical access for disabled persons consistent with the preservation of significant prehistoric, historic, and ethnographic attributes. Design and installation of facilities for handicap access will be in a manner that least affects historic qualities; if modifications would compromise significant historic fabric of the property, they will not be made. Design will involve experts in both accessibility and historic preservation.

Protecting Resources from the Effects of Use. Sites adjacent to facilities, roads, and trails may suffer secondary impacts from visitor use – that is, "wear and tear" from foot traffic and recreational activities. Intensive surveys and evaluations will be completed for areas likely to receive secondary impacts, and mitigations will be prescribed.

Protective measures such as restrictions on visitor access will be designed to reduce impacts on sites. Informal foot trails and vehicular ways that lead to sensitive archeological sites will be blocked and the tracks revegetated. Sites that have had extensive past disturbance may be backfilled to lessen their visibility. Ruins and historic structures will be stabilized as appropriate. Well-defined self-guiding trails and other such structured activities will discourage visitors from leaving designated areas and collecting or inadvertently disturbing the privacy of American Indians. The Park Service will use the permitting process to encourage backcountry visitors to areas of particular interest while minimizing impacts on sensitive natural and cultural resources.

Numerous rock cairns (stone markers) have been put on the lava by pothunters, spelunkers, and others. Although some cairns mark contemporary routes, others are undoubtedly prehistoric, and some may be related to use by contemporary American Indians. Extreme care will be taken to protect and leave in place those cairns that mark prehistoric routes or features currently used by Indians.

Recent historic preservation legislation requires federal agencies to inform the public about the problems involved in protecting cultural resources. Public involvement and education programs will be developed at El Malpais to help visitors understand the science of archeology and the problems caused by looting. Public involvement will increase volunteer activity in resource protection, which has been found to be the most effective means of dealing with hobbyists and casual collectors. Changing the attitudes that lead to theft and defacement is crucial. New attitudes eventually lead to extralegal sanctions, such as peer disapproval and stronger moral standards. Some existing programs may be used.[18] NPS managers will determine the most effective programs to accomplish the following goals:

to foster a feeling of ownership and responsibility for our common heritage

to increase public understanding of the science of archeology

to enhance public awareness of the current threats to archeological resources

to increase understanding of how the public's actions affect archeological resources

to increase public involvement in legitimate archeological activities

Managing the Collections

Museum objects and collections, study collections, archeological materials, natural resource specimens, exhibits, and interpretive items are essential to achieving the purposes of the monument, including scientific research, historic preservation, and interpretation and education. Besides natural and cultural objects, collections include field notes, photographs, oral histories, building plans, maps, archival records, letters, etc., dealing not only with history but with the disciplines of paleontology, geology, biology, anthropology, and archeology.

At present the monument has no formal collections, no collections storage, and no collections policy. Guidance for acquiring objects and documents that contribute directly to the understanding and interpretation of the monument's themes will be provided by a scope of collections statement. An interim scope of collections statement consistent with the 1988 NPS *Management Policies* (4:4 and 5:10) and NPS-28 will be developed immediately by monument staff in consultation with the regional curator to guide accession policies until the final scope of collections statement can be completed. This interim policy will coordinate with BLM collections policies wherever feasible.

Guided by the scope of collections statements, the Park Service will acquire by purchase or donation relevant artifacts, photographs, field notes, oral histories, and other supporting data from various sources (including private interests and public institutions) to establish a baseline collection for exhibits and interpretation. For example, various items and furnishings that are currently part of the privately owned trading post at Bandera Crater are important to interpretation of the themes of volcanism, prehistory, and tourism and recreation and may be acquired.

It is important that items of historical or scientific interest be evaluated in their own right, not just

18. The NPS Archeological Assistance Program, the NPS Listing of Education in Archeology Projects, state and local programs about protection of resources (including teacher training kits, special exhibits in public buildings, cultural design competitions, crafts shows, newsletters, and adopt-a-site and stewardship programs), and public involvement programs (where volunteers do anything from displays and programs to actual on-site and laboratory activities under the supervision of professional archeologists, architects, and historians) are among some of the choices management has. Informed volunteers become avid resource advocates and often contribute their own professional expertise, saving the Park Service appreciable amounts of money and resources.

acquired as part of a package collection or with other property acquisitions. Items determined to be significant and relevant to monument purposes will have high priority for acquisition. The Park Service will acquire only those collections with a legal and ethical pedigree, in accordance with existing laws and management policies (1988 NPS *Management Policies* 5:10).

Some artifacts from prehistoric sites currently used by American Indians for religious purposes may be considered by them to have special religious significance. American Indians may present a strong claim for some such items, arguing a long continuum of site use, especially at those sites they perceive as ancestral. However, because the Park Service has legal responsibilities to be accountable for the archeological artifacts from lands it manages, determination of responsibilities and treatment of these individual items will be handled on a case-by-case basis under NPS-28 and the 1988 NPS *Management Policies*. At the same time, it is important to continue to consult with American Indians, working out the most feasible approach to management of the resources that are significant to these contemporary peoples.

Requests for repatriation (return) of objects and materials to American Indian groups or individuals will also be handled on a case-by-case basis. The National Park Service will repatriate museum objects when lawful and when it can be demonstrated by a American Indian group that the materials are their inalienable communal property (1988 NPS *Management Policies* 5:10).

A collections management plan will be developed to guide the management of monument collections. Accessioning, cataloging, and storing collections will follow this plan and the procedures outlined in NPS-28 and the *Museum Handbook, Parts I and II* (NPS 1984).

Future disposition of collections and objects will be guided by the NPS policies and guidelines mentioned above. Archeological materials will not be disposed of without consultation with and permission of the regional curator. Dissemination of information to the public or researchers regarding archeological and anthropological materials and other sensitive topics may occur only in accordance with policies governing release of confidential data (1988 NPS *Management Policies* 5:12 and 8:9).

Once the basic collections management documents have been developed for El Malpais, a concerted effort will be made to locate, inventory, and photograph artifacts and documents previously removed from El Malpais through archeological investigations or private collecting. Records from past surveys and archival materials held by public institutions should be microfilmed and added to the monument collection to assist managers, researchers, and interpreters.

The monument currently has no storage facilities for collections. Adequate space will be provided at monument administrative headquarters in Grants. An interim collections storage plan will be developed to guide this effort, and the plan will become part of the later collections management plan. Collections storage will be in agreement with NPS-28 (3:16), which requires that collections be housed in secure and safe storage facilities that are not in the same room with incompatible activities or materials. This space will be of a suitable nature, spatially adequate, well organized, and environmentally safe and stable. Appropriate fire protection and physical security will also be provided.

The space leased in Grants is unlikely to meet all NPS standards for collections storage. Materials requiring special environmental controls will be transferred to the NPS Western Archeological and Conservation Center.

Interpretation

The monument's interpretive programs will deal with natural and cultural resources themes specific to El Malpais, as described in the "Visitor Services/Interpretation Plan" section. Many visitors are deeply interested in the archeology, history, and ethnography of the Southwest, themes that are all relevant to El Malpais.

The unique constellation of landforms, plants, animals, and traditional human uses of El Malpais suggests that interpretative themes should present a holistic and integrated view of all these resources. This multidisciplinary approach to cultural resource research and interpretive exhibits and programs can result in exciting educational opportunities and experiences for visitors.

Cultural sites and structures vary widely in their visibility and attractiveness, and many are not particularly interpretable. Accessible sites that are appealing, highly visible, and have interesting stories will receive a high priority for research if they also have the potential to enrich interpretive programs.

Various ethnic groups may understand the meanings of different words in many different ways. In addition, there are different names for geographic features. American Indians are familiar with traditional names given to these features long ago and may not always recognize the current Spanish or Anglo names. Therefore, in pursuit of properly defining the cultural landscape, alternative traditional names for landmarks will be fully considered. This could make maps, exhibits, and interpretive programs more interesting to everyone.

Traditional arts and crafts may need to be acquired for interpretive exhibits, but NPS policies will be followed to ensure that no sacred objects such as medicine bags, bundles, pipes, masks, and effigies will be acquired and displayed, and that other items are treated in an appropriate manner.[19]

NPS *Management Policies* provide for active involvement of concerned American Indian groups in the planning, development, and operation of interpretive programs that relate to the history and culture of these groups. Indigenous groups, particularly American Indians, are one of the monument's most important cultural resources. Contributions of American Indian stories, poetry, traditions, and insights enrich and strengthen the interpretive story.

The interpretive programs must convey to the visitor a sensitive and respectful view of contemporary American Indians, Hispanics, and others whose lives are intimately connected with El Malpais. The Park Service will work with these groups in preparation of information and media. By serving as interpreters, local American Indians could contribute valuable perspectives to the interpretive program. Programs dealing with ethnographic topics will be as factual and balanced as possible. What is said to the public will be information only at levels acceptable to traditional Indian authorities and will be only information that contributes to better understanding of the Indian perspective about the El Malpais landscape. In addition, the monument staff will also work with the NPS Harpers Ferry Center to evolve appropriate media for the interpretive story.[20]

The *Final Joint Management Plan: Chaco Archeological Protection Site System* (NPS 1983b) identified Las Ventanas as an important outlier within the larger prehistoric Chacoan system and calls for a unified approach to interpretation of sites within the system. The monument staff should involve themselves in the Interagency Management Group as a way to better understand the site and to coordinate interpretation with that presented at other major outliers.

Coordination with the Bureau of Land Management

The Bureau of Land Management and the Park Service will continue to work closely to coordinate their cultural resources programs and resolve management issues that result from differences in their policies and legislative mandates. This coordination is crucial in regard to ethnographic programs, interpretation of the cultural landscape, fire and resource management, trails, and wilderness. Much of the interaction and cooperation between the two agencies is on an informal basis, and will continue to be fostered by shared office space in Grants.

More formal coordination includes the establishment of the Native American Consultation Committee with representatives from the Bureau of

19. "The National Park Service will not exhibit native American disinterred skeletal or mummified human remains or photographs or replicas of them. There will be no display of grave goods or other objects if native Americans who are culturally associated with them object to such exhibit. Associated native American tribes and groups will be consulted to determine the religious status of any object, the sacred nature of which is suspected but not confirmed, before it is exhibited or before any action is taken" (1988 NPS *Management Policies* 7:5).

20. See "Visitor Services/Interpretation Plan" section for further discussion of proactive ideas regarding development of ethnographically sensitive interpretation.

Land Management, the Park Service, and the various Indian groups. This committee meets regularly to help ensure an effective and unified ethnographic approach for El Malpais.

Discussions among the Bureau of Land Management, the Park Service, and American Indian groups will help shape the various plans for resources management, the cultural landscape, ethnography, and research. The Park Service and the Bureau of Land Management will jointly review agency documents to resolve issues and adjust programs to accommodate any differences. Close coordination is especially important in preventing incompatible uses or development in adjacent areas of the monument and conservation area.

THE PLAN FOR NATURAL RESOURCE AND WILDLIFE MANAGEMENT

Introduction

El Malpais National Monument is one of the newest additions to the national park system, and the status of many of its natural resources is uncertain. Although several studies have been conducted in the area, especially geologic studies, data about other natural resources are sparse. A resources management specialist has only recently been hired at the monument, and the development of a resource management program is only now beginning.

This initial or interim plan for managing the natural resources, as contained in this section, is required by the legislation that established the national monument/conservation area. The legislation also calls for a separate wildlife management plan, but because of the interrelationship of all natural resources, including wildlife, wildlife management proposals are incorporated into this interim plan rather than in a separate plan. In addition, consultation with the New Mexico Department of Game and Fish (NMDG&F) and the U.S. Fish and Wildlife Service (USFWS) has revealed no major monument wildlife issues. Consultation with the NMDG&F and the USFWS will continue on any future plans relating to monument wildlife.

This plan for managing natural resources will state preliminary natural resource objectives; address management status, issues, and needs based on a preliminary evaluation of available data; and current interim actions that will be taken. A future resources management plan (RMP), which includes natural and cultural components, will be written based on expanded resource knowledge as well as growth in management experience with the resources. As more specific and refined data on park resources become available, a geographic information system (GIS) for the monument will be developed, using data from the GIS developed by the BLM.

The El Malpais legislation ensures access to American Indians for traditional religious and subsistence activities, including gathering of pinyon nuts. These concerns were addressed earlier in the cultural resource portion of this plan in the section on subsistence uses.

Objectives for Managing El Malpais' Natural Resources

Natural resource objectives, as specified in El Malpais National Monument legislation are that

> the Secretary [of the Interior] shall protect, manage, and administer the monument for the purpose of preserving the scenery and the natural . . . resources of the monument and providing for the public understanding and enjoyment of the same in such a manner as to perpetuate these qualities for future generations.

In support of legislative intent, the monument's interim natural resource management objectives, by management topics in priority order, include the following:

> Interpretation - To develop and conduct natural resource interpretive programs that help preserve natural resources through public understanding and appreciation of natural ecosystems.
>
> Visitor Use - To identify and regulate appropriate recreational uses such as hiking, caving, picnicking, and camping and to monitor all areas for effects of these activities based on ecosystem tolerance; to develop recreational facilities and provide backcountry information and permits that are designed to limit resource impacts.

Law Enforcement - To protect the natural resources by providing trained personnel to enforce applicable laws and regulations; to establish cooperative agreements with other government organizations, local law enforcement agencies, and private landowners to assist in the protection of monument resources.

Facility Development - To develop facilities that are harmonious with and blend into the surrounding environment, using natural materials whenever possible; to avoid overdevelopment of facilities; to provide a monument collection facility for protection and storage of natural resource collections.

Scientific Research - To establish research programs that identify, evaluate, monitor, restore, and maintain/preserve natural resource values and ecological processes.

Cooperative Planning - To work with local, state, and federal agencies to assist in achieving mutual management goals and objectives.

Natural and Wildlife Resource Status and Needs

Lack of Information. Baseline data on resources such as soils, flora, fauna, hydrology, air quality, and fire history are incomplete. Approximately 95 percent of the monument is lava terrain that is rugged, generally inaccessible by vehicles, and difficult to traverse on foot. Little research and few inventories have been done because of these conditions. The Bureau of Land Management (BLM), U.S. Forest Service (USFS), U.S. Soil Conservation Service, state of New Mexico, University of New Mexico, and individuals such as ecologist Alton Lindsey have conducted various studies of the biota of the area, but most information is dated and limited in value for monument management purposes. (In contrast, studies of volcanic phenomena by geologists have been extensive.)

As part of the planning process, current data have been collected and initial evaluations have begun. Recent inventories include a lava tube inventory (NPS Carlton 1988b) and a lava surface features inventory (NPS Carlton 1989a). The El Malpais staff, with assistance from the NPS Southwest Regional Office has completed a grazing management plan. Comprehensive vegetation and soils mapping, which includes the monument, is being performed by the Bureau of Land Management in conjunction with their planning process. The Soil Conservation Service is completing a comprehensive soils survey of Cibola County (including all of the monument).

However, much remains to be done. Large areas of the monument remain uninventoried. Additional data collection, research, and monitoring are needed to help identify the current condition of natural resources and immediate or potential threats before comprehensive protective measures are prescribed. The identification and documentation of the condition of all natural resources is essential to formulation of future management strategies to protect and preserve monument natural resources. Knowing the status of all natural resources will provide a baseline against which changes can be measured and appropriate management actions taken. Limited and incomplete data would make management decisions speculative, possibly resulting in mismanagement, including possible degradation or destruction of resources.

To remedy this critical deficiency, a more thorough inventory and evaluation of natural resources will be performed on a high priority basis. Quality copies of past reports, studies, and maps will be obtained. Information will be compiled and stored in an integrated and retrievable system for efficient use. Some ground-truthing and data adjustments may be necessary. Data will be made compatible by standardizing map scales, nomenclature, and other parameters. Additional inventories and studies relevant to management needs will be identified and initiated.

Reclamation/Revegetation of Damaged Areas. Several areas in the monument have been damaged from past and present resource exploitation. Affected sites include one active and two inactive cinder pits, a 25-acre earthen and lava rock borrow area, an abandoned sandstone quarry, and several miles of vehicular ways. Two of the cinder pits, the borrow pit, and the sandstone quarry are on private land within the monument boundary. The vehicular ways, several of which are on private land, historically provided access for timber and livestock operations and possibly hunting, but many no longer provide any legitimate

use. Large scars resulting from human activities, some on steep slopes, are resulting in major erosion problems and are visual intrusions. These disturbed soils cause a proliferation of exotic vegetation and a loss of wildlife habitat. Vehicular ways are still occasionally used by monument visitors who believe they are designated roads, which they are not. Continued use, even occasional, results in continued degradation of resources. Natural restoration takes a long time because of compacted soils and continuing erosion on steep slopes.

To alleviate this damage, extensive reclamation/revegetation efforts will be undertaken. Restoring the cinder and borrow pits and some of the vehicular ways that are on private land would require federal acquisition of some properties. Ways not on private property and considered nonessential will be officially closed or their use restricted by gates or barriers.

Air Quality Management. The monument is designated a class II area under the 1977 Clean Air Act (42 U.S.C. 7401 et seq.). The act establishes maximum allowable increases beyond baseline concentrations of sulfur dioxide, particulate matter, and nitrogen oxides – increases that cannot be exceeded at a class II area.[21] Section 118 of the act requires the monument to comply with existing federal, regional, state, and local air pollution control laws and regulations.

Visibility/air quality is a primary monument resource. The air in Cibola County and El Malpais either meets or is better than the National Ambient Air Quality Standards (NAAQS) established for all criteria pollutants (sulfur dioxide, total suspended particulate matter, ozone, carbon monoxide, nitrogen oxides, and lead). Currently, El Malpais air quality appears to be excellent except for occasional short periods of regional haze. However, there is no monitoring within the monument, and no monument-specific determination of compliance with federal and state sulfur (SO_2) and nitrogen (NO_2) oxides, suspended particulates, or other air quality standards. There is insufficient data to determine soil, vegetation, and water quality conditions as they relate to air quality.

There are no major sources of air pollution in the immediate vicinity of the monument; however, there are major sources of pollution in the region that could impact the monument's air quality. These include coal-fired power plants at Thoreau, New Mexico (50 miles away, which burns about one million tons of coal per year), Farmington, New Mexico (125 miles away), and Holbrook, Arizona (175 miles away). Construction of a second 233-megawatt coal-fired power plant near Thoreau is being considered. The proposed Bisti coal-fired power plant, which would be about 85 miles north of El Malpais (near Chaco Culture National Historical Park), could also have an adverse impact on the monument's resources if it is constructed.

Mining, another potential source of pollution, is a major economic activity in western New Mexico. The El Malpais region contains several large coalfields, and increased energy development in the region could threaten existing air quality levels. The uranium mining and milling near Grants, a possible source of particulate matter, is essentially shut down. The nearest copper smelter is in Hurley, New Mexico, 165 miles southwest of the monument. Other smelters are in El Paso, Texas, southeastern Arizona, and northern Mexico.

Fossil-fuel combustion results in increased SO_2 and NO_2. Concentrations of these pollutants are known to be harmful to a number of fragile plant species, some of which are found in the monument. These include Douglas-fir, ponderosa pine, and lichens. The monument contains over 70 identified lichen species. Lichens, when moist, absorb gases over their entire surface and are extremely vulnerable to injury induced by elevated levels of SO_2; as such, they can be used as bioindicators of ecosystem air pollution stress. In cryptogamic associations with various algal species, lichens play a crucial role in the stability and health of arid shrub and grasslands such as those at El Malpais. A lichen study in 1984 found no indication that the lichen were being affected by pollutants at that time (DeBruin 1984).

21. A national monument automatically becomes a class II area when established. However, it appears that the air quality at El Malpais may be worthy of a higher standard, and the Park Service would cooperate with the state to raise the standard if further studies show that a higher designation is warranted.

To better protect the monument's air quality, including the atmospheric quality of viewsheds and the protection of the monument's flora and fauna, air quality data will be collected and documented. Monitoring and testing studies will be conducted to determine levels of gaseous pollutants, particulate matter, and acid deposition levels at El Malpais. The monument staff will work with the New Mexico Air Quality Bureau to ensure that all internal activities meet the requirements of the New Mexico State Air Pollution Control Implementation Plan (SIP) (40 CFR 52.1620 ff, approved July 1, 1988).

Management of the Monument's Visual Quality. The visual quality of the monument greatly influences the visitor's overall recreational, educational, and spiritual experiences. Landscapes and viewsheds both within and outside the monument are critical resources and contribute greatly to the aesthetic values of the monument. Key landforms within the monument, such as Sandstone Bluffs, Cerro Bandera, Bandera Crater, and others are described in the "Visitor Services/Interpretation Plan" section. Key landforms outside the monument that can be clearly seen from within the monument include Mt. Taylor (north – a shield volcano and the highest peak in the region), Chain of Craters (west), the Sawtooth Mountains (south), Mesa Negro and Cebollita Mesa highlands (east), and the Zuni Mountains (northwest). Another important aspect of the monument is the vast expanse of open volcanic badlands that give the visitor an appreciation for the extensive geological activity that took place in the area.

Management practices inside and outside the monument can affect visual quality. Impacts outside the monument include scars from mining and ranching operations, powerlines, and roads. Within the monument borrow and cinder pits, heavily grazed and timbered areas, roads, powerlines, and buildings also impact visual quality.

To mitigate visual impacts and prevent further impacts, the monument staff will work cooperatively with private landowners, local governments, federal agencies, and others. Also, the monument facilities will be carefully designed – to harmonize with the surrounding landscape. Areas disturbed will be revegetated and restored to their natural appearance.

Fire Management. Only 20 years of fire data has been collected, and during this time there have been about 100 natural wildfires in and near the monument. Most have been small, less than 1 acre, but several large fires have occurred (10,266 acres in 1976, 40 acres in 1980, 400 acres in 1984, and 90 acres in 1988). Four fires in 1989 resulted in 6,500 acres being burned. The effects of these fires on vegetative composition has not yet been evaluated.

El Malpais National Monument is developing a fire management plan (anticipated completion is early 1990). The current practice is total suppression, and this will continue until a plan to determine future actions is developed and approved by the Boise Interagency Fire Center. The plan will address management of wildfires and prescribed fires.

Past buildup of natural fuels due to full fire suppression policies require that the Park Service use hazard fuel reduction techniques to restore a natural balance.

Also needed is a fire ecology research program to provide information on fire history, ecological effects from past fires, fuel-load buildup areas, and other data. The importance of naturally caused (lightning) fires in maintaining biotic diversity is well recognized. A fire ecology research program would also determine prescriptions for specific wildland fire[22] management techniques that would assist with the comprehensive management of monument flora and fauna, prevent damage to cultural resources, and perpetuate natural ecosystems. A fire management plan that is compatible with BLM and USFS fire management practices will be developed in accordance with the *Final Report on Fire Management Policy* (U.S. Department of Agriculture/Department of the Interior 1989).

22. According to the *Final Report on Fire Management Policy*, there are two kinds of wildland fires – "prescribed fires and wildfires. Prescribed fires may be ignited by managers, or naturally occurring fires may be allowed to burn, under specified conditions to achieve established management objectives. Any other fire is considered a wildfire, and appropriate suppression action is taken on all wildfires."

Water Management. In the monument's establishing legislation, Congress directed the Park Service to preserve the significant natural and cultural resources of the lava flow areas and manage them for the benefit and enjoyment of present and future generations. Preserving the natural resources includes the roles that naturally occurring water plays. As explained in the "Visitor Facility/Development Plan" section, attempts are being made to acquire these water rights.

Boundary Survey and Identification/Marking. El Malpais National Monument has approximately 130 miles of irregularly shaped boundary, which has not been officially surveyed or, in most areas, marked. (An official [legal] description of the boundary has recently been prepared and transmitted to Congress.) Without an official survey and clearly visible boundary markers, monument land could be mistaken for land outside. Adverse impacts may result – illegal woodcutting, hunting, poaching, and disputes with adjacent landowners. To adequately protect monument resources, the boundary will be surveyed, monumented, and marked/fenced.

Backcountry/Wilderness Management. Although the rugged backcountry lava areas seem undamageable, many fragile resources are present. As visitation grows so will the demand for backcountry use, and impacts to resources will likely result. Also, almost 85 percent of the monument appears suitable for wilderness designation and must be managed to protect wilderness qualities and values until Congress takes formal action (see "Wilderness Suitability Study" section of this document).

To manage the demand for recreation and assist in resource protection and backcountry search-and-rescues, a permit system has been established and is in use. The permit system ensures that backcountry users fully understand the regulations, requirements, and inherent backcountry dangers and aids in the protection of natural and cultural resources.

A backcountry/wilderness management plan will be prepared to protect the primitive character of the terrain and will include provisions for managing use and protecting the resources. It will include continued use of the backcountry/wilderness permit system and establishment of a resource monitoring program. Standards and restrictions for uses such as trail marking, camping, campfires, toilets, and other activities will be defined. Methods of controlling off-road use will be prescribed. Planning will include consultation with American Indians.

Grazing Management. Livestock grazing has occurred in the monument for approximately 150 years. Sheep were originally the major domestic grazer; now it is cattle. There are several existing grazing allotments in the monument, but as specified in the El Malpais legislation they will expire at the end of 1997. Until this time, provisions must be made for operators to maintain herds and associated ranching developments such as stock tanks, pipelines, fences, and corrals. Ranching developments on federal land will be removed (after assessments of sites and structures to determine if they have historic values). El Malpais staff, with assistance from the NPS Southwest Regional Office, has completed a grazing management plan that addresses the many issues related to grazing. Grazing often results in adverse impacts on resources, including wildlife, vegetation, soils, cultural sites, and recreation. The full effect of past and present livestock grazing on monument resources is unknown, and as a result a program to document the impacts from grazing are recommended.

Lava Tube and Ice Cave Management. The monument contains extensive lava tube systems. A lava tube inventory (NPS, Carlton 1988b) was conducted shortly after the monument was established, but because of limited time and funds this survey was not comprehensive. The contractor explored and documented the 16-mile central tube system within the Bandera lava flow and several miles of other tubes. Some lava tubes in the monument have not yet been inventoried.

Accessible caves are very popular with visitors. The number of cave visits is unknown, but as use increases so will the likelihood of impacts that disturb fragile features including biota and mineral and lava formations. In Braided Cave, for example, there are fragile lavacicles, delicate crystals of both common and rare minerals, and gray sand and tiger stripe deposits. These can be damaged by touching, breaking, and graffiti. These and or other sensitive biota and mineral and lava formations are known to exist in some of the other caves in the monument, but baseline data as to the extent of these formations is not yet established. Inventories of the condition of these resources and other research is needed.

Caves as well as lava surface resources hold special significance to local American Indians. This concern is recognized by the Park Service, and measures are needed to ensure that American Indian interests are protected.

Several tubes containing ice formations are referred to as "ice caves." These caves may contain water and/or temperature-sensitive resources. The ice may preserve important prehistoric atmospheric, climatic, and vegetative (pollen) data. Very little is known of the dynamics of ice formation or the impacts of visitors. Baseline data, monitoring, and research are needed to determine the distribution and dynamics of ice formation, annual/seasonal cycles that influence ice formation, conditions needed to ensure permanence of ice, ecologic conditions and species associated with the ice caves, and effects of visitation on the ecology of the ice caves.

To obtain the needed data, the additional studies will be done. A comprehensive cave management plan will be prepared, which will address the issues related to preservation of underground resources as well as monitoring and assessing visitor use impacts and prescribing necessary mitigations such as public education, guided tours, and permit entry. The plan will determine specific management policies and appropriate use levels, identify long-term monitoring needs, and develop measures to protect cave resources, including ice. Interested individuals, members of cave organizations, and cave science professionals will be invited to participate in the cave management planning process in accordance with the Federal Cave Resource Protection Act. The protection of cave resources might also become part of the monument's comprehensive impact management program, which is discussed in the "Carrying Capacity and Impact Management" section of this document.

Lava-Edge Ecotone Management. One of the smaller but important and easily disturbed biolgocial communities in the monument is the lava-edge ecotone. Occurring along all lava flow edges, even in areas where the lava is only a few feet high, this ecotone provides moist growing conditions and supports many trees, shrubs, and forbs in unusual density.

Because these ecologically important areas are often aesthetically attractive to visitors, special protection and/or enhancement measures will be undertaken where needed and possible.

Wildlife Management. The status of monument wildlife is only partially known. Wildlife inventories are incomplete, and the extent that wildlife species use the different habitats in the monument is unknown. More information is needed, including species density, population numbers, range conditions, historical use, and identification of critical habitat. It is assumed that the lack of water and rugged terrain will continue to be limiting factors for monument wildlife.

Management objectives will be to perpetuate native wildlife species and natural population numbers, to be accomplished through protection and enhancement of critical habitat and prevention of illegal hunting and trapping. Supplementation and reintroduction of certain species may be feasible and, if so, will be coordinated with appropriate state and federal agencies. Wildlife protection will be encouraged on public and private lands within and adjacent to the monument through the establishment of cooperative agreements. Extirpated wildlife species such as bighorn sheep will continue to be studied for possible reintroduction (see later section on reintroduction of bighorn sheep).

Bats – El Malpais provides both summer and winter habitat for a variety of bats including the Mexican free-tailed; Townsend's big-eared; hoary; pallid; and several species of myotis, including long-eared, fringed, long-legged, and small-footed. There is far less chance that the monument provides habitat for others, including silver-haired, big brown, and spotted bats. Several of these species are listed as federal notice of review species (category II), which means there is concern the species is in jeopardy but information is insufficient to decide on official listing as a threatened or endangered species (see later discussion on threatened and endangered species).

Several bat caves/colonies exist in the monument, but by far the most popular for visitors is Bat Cave near El Calderon. The cave provides summer habitat for a large colony of Mexican free-tailed bats and winter habitat for a much smaller population of various species including the Townsend's big-eared bat (a federal notice of review

species). Evening bat flights are a popular visitor attraction in summer and, although not promoted, popularity is increasing. During the 1950s, ecologist Alton Lindsey estimated the summer Mexican free-tailed population at Bat Cave at approximately 40,000 bats. Today, the population may be as low as 6,000. The reasons for decline are unknown, but from studies done on the Mexican free-tailed bat colony at Carlsbad Caverns National Park and other management experience it has been found that bat colonies in general were affected by ingesting pesticides on the insects they eat. Also, the impact of past visitors entering Bat Cave at El Malpais is unknown and is possibly a contributing factor. Smoke or shining lights on sleeping bats will adversely impact the colony. An ecological study is needed to determine bat habitat and population, migration patterns, local impacts on this colony, the effects of increased visitation on the colony, and what other potential problems may exist. Although there is particular interest in obtaining information about the Mexican free-tailed bat colony and the population of Townsend's big-eared bats at El Calderon, this information is also needed for other bat species and colonies in the monument.

Baseline inventories and monitoring will be conducted for all significant caves in the national monument, including those to be visited by the public, and the Park Service will consider the input of qualified specialists in designing the studies. The Park Service intends to allow scientific investigations to proceed in Bat Cave and all other resource areas of the monument.

Disturbances to the bat population near El Calderon will be mitigated by ranger patrols, closing the cave by signing, and educating visitors to observe the bat flights from restricted areas. If these measures are not effective, additional protective measures will be prescribed.

Other problems related to bats are that they carry and can transmit disease to humans, including rabies and histoplasmosis. Visitors will be warned about these dangers, which will help reduce the potential for disease transmission.

Mule Deer – The monument mule deer population is probably small. The major limiting factors are lack of water and the rugged lava. The northern part of the monument near El Calderon appears to have the greatest deer concentration, its shrub-conifer and deciduous vegetation providing excellent summer and winter habitat.

The NMDG&F performs a local hunter license census on game populations including mule deer. However, this census does not provide accurate estimates on monument wildlife populations because hunting is prohibited in the monument and state hunting units do not coincide with the monument boundaries.

Information needed on mule deer includes their population, identification of migration patterns and routes, location of summer and winter range, and buck:doe:fawn ratios.

Elk – Elk are neither numerous nor permanent monument residents. They occasionally use areas near Bandera Crater, however this use is inconsistent and probably only transient. Lack of water is likely the limiting factor.

Turkey – The turkey population in the monument is unknown. Sightings are frequent near East Rendija. A preliminary estimate by NMDG&F personnel indicates that the monument once provided suitable habitat for a much larger number. As with mule deer, major limiting factors are most likely lack of water and the rugged terrain.

Information needed on turkeys includes their population, existing and potential habitat locations, and tom:hen ratios.

Pronghorn – Pronghorn occupy the monument in the area south of the Laguna flow. Areas along the southern monument appear to provide adequate forage, however water is very limited. Areas just south of the monument support pronghorn, but there is a high fawn mortality. The reasons for the high mortality are unknown, but may be predation, lack of food and water, and competition with cattle.

Information needed includes a population estimate.

Raptors – The monument supports several raptor species, including kestrel, prairie, goshawk, red-tailed, Cooper's, and rough-legged hawks; great horned, pygmy, long-eared, and burrowing owls; and turkey vultures. Golden and bald eagles are occasionally seen foraging in the monument. The sandstone cliffs east of the monument provide raptor nesting habitat, and cave entrances and collapse structures provide owl nesting habitat. However, nesting has been declining in recent years for unknown reasons. Raptor poaching occurs elsewhere in the United States, but it is not known if it is a problem in the El Malpais area. Carcass poisoning to control coyotes likely results in some raptor mortality.

Important raptor nesting/foraging areas need to be identified, and actions need to be developed to protect these species.

Black Bear – Black bear are occasionally seen in the Bandera Crater area. Bears are not now a serious problem, but with development of monument facilities, human/bear encounters could become a problem in the monument.

Black bear habitat and numbers need to be determined. A bear management plan may be needed if human/bear encounters begin. Because bears are so wide ranging and peripheral areas may be involved, bear management strategies should be developed in cooperation with state and federal agencies. Monument facilities such as the campground and residences may need to be designed with consideration of potential bear problems, and animal-proof trash containers will be used at developed areas.

To systematically increase information about wildlife and improve management decisions, population inventories and habitat studies will be conducted. As needs for specific programs are identified, cooperative wildlife management agreements with state and federal agencies and appropriate consultation with local American Indian groups will be established. Species management plans will be developed as needed.

Threatened and Endangered Species Management. Management of threatened and endangered plant and animal species will be as follows.

Plant Species – The potential exists for the presence of certain proposed or nominated threatened, endangered, or federal "notice of review" plant species within the monument. However none were identified during a survey of representative area habitats completed in 1979. The survey recommended a late-season inventory to better identify late-flowering threatened and endangered species; this additional survey was never performed. Federal notice of review species do not yet have legal protected status, however NPS mandates require protective measures for all species including notice of review candidates.

Animal Species – There are numerous threatened (t), endangered (e), and federal notice of review (r) animal species known (k) or having potential (p) to occur in the monument. These include the peregrine falcon (e, p), bald eagle (e, k), black-footed ferret (e, p), Townsend's big-eared bat (r, k), white-faced ibis (r, p), Swainson's hawk (r, p), ferruginous hawk (r, p), spotted bat (r, p), mountain plover (r, p), long-billed curlew (r, p), "western" yellow-billed cuckoo (r, p), and "southern" spotted owl (r, p).

Further information is needed about monument use or critical habitat of the above-listed animals or any other threatened or endangered species that are discovered.

To identify and protect potential threatened and endangered and federal notice of review species, a two-phase approach will be taken. The first involves survey and assessment of all development sites for these species and their habitat. The second involves completion of a monument-wide survey. If threatened, endangered, or federal notice of review species are identified, protective measures will be developed in consultation with the USFWS and other appropriate agencies. These protective measures will include thorough determination of distribution, monitoring, and protection of habitat.

Managers will also be aware of changes in federal status of these species, which would require identification of critical habitat and other actions in

compliance with the Endangered Species Act of 1973, as amended.

Vegetation Management. There is no detailed, comprehensive inventory of monument vegetation. The Bureau of Land Management has used remote sensing to develop a small-scale (1:100,000) vegetation map that includes the monument. The map identifies eight vegetative communities in the monument. However, on a larger scale, little information on plant communities is available, and BLM's data is not adequate for site-specific planning and specific resource management actions and decisions. The rugged lava has prevented identification and exploitation of monument vegetation, including vegetation in many backcountry areas and kipukas (which are isolated islands of older rock and vegetation surrounded by lava flows). Initial evaluation shows fragile species and unusual plant associations, including uncommon lichen species and grasses, in certain kipukas and other restricted habitats such as caves and crevices. Two New Mexico sensitive species, grass fern *(Asplenium septentrionale)* and maidenhair spleenwort *(Asplenium trichomanes)* were identified in a 1979 survey. Some kipukas have such undisturbed and vigorous associations of native species as to suggest the possibility of establishing one or more research natural areas.

As described earlier, livestock have grazed in the monument for at least a century. Grazing has likely altered the native vegetation and introduced exotic plant species, but the extent is unknown.

As backcountry/wilderness use increases, the potential for impacts on vegetation will also increase. Sensitive plants could be damaged or destroyed, possibly resulting in the loss of some plants. Plants and vegetative associations, including lava-edge ecotones, need more thorough study of significance, and if appropriate, one or more research natural areas will be established to ensure preservation and to assist in long-term research needs.

To improve management of the monument's vegetation, detailed inventories and studies will be conducted and a vegetation management plan will be prepared. Plan components will include reestablishment and maintenance of native plant communities and identification and elimination of exotic species. If necessary, an exotic species management plan will be prepared. If sensitive species are present in areas proposed for development, protective measures will be taken. The vegetation management plan will be developed in conjunction with the fire management plan, the grazing management plan, the threatened and endangered species surveys, the cultural resources management plan, and other appropriate plans and studies. Also, although the Park Service has no legal requirement to do so, measures will be taken to protect the two sensitive state species (mentioned above) where they occur.

Reintroduction of Bighorn Sheep. It is not known how or when the bighorn sheep population – once native to the monument – was extirpated; however, this species still inhabits areas of the Zuni Mountains just west of the monument. Bighorn sheep skeletal remains have been recovered from the monument and are being evaluated by the Museum of Southwestern Biology to determine which subspecies of bighorn was endemic to the El Malpais. (Preliminary analysis indicates that they are remains of Rocky Mountain bighorn.) The bighorn is an important species that is now missing in the monument. The NMDG&F has identified El Malpais National Monument and National Conservation Area as one of 10 areas in the state for possible reintroduction of bighorn sheep. Further studies are needed to determine if this is suitable habitat. If determined practicable, a bighorn sheep reintroduction program and associated management plan will be developed in consultation with NMDG&F, BLM, USFWS, and possibly local American Indian groups.

MONUMENT BOUNDARY ADJUSTMENT

Boundary issues were examined as part of the planning process, as specified in section 604 of the National Parks and Recreation Act of 1978 (16 U.S.C. 1a-5 et seq.). Authority for modifying boundaries is contained in the Land and Water Conservation Fund Act amendments of June 10, 1977 (Public Law 95-42). Per this authority, the size and configuration of the multiagency center site near Grants has been administratively adjusted. Approximatley 443 acres of land will be acquired in fee (instead of the original 1089-acre tract that was set aside in the legislation for the center. The approximatley 646 acres of additional land was unnecessary for development of the center and was not necessary for protection or enhancement of the view from the center. This boundary modification

was solely an administrative change between the national monument (the Park Service) and the national conservation area (the Bureau of Land Management).

STAFFING

Over the next 10 years visitation to El Malpais National Monument is expected to increase greatly. During this time the Park Service will acquire private lands and develop numerous new facilities. Public use of the monument's facilities, roads, and trails will require additional staff to ensure proper resource protection and visitor services.

At full implementation of the plan, total staffing will be 31.7 full-time equivalents (FTEs). Above the existing level of staffing, this will require an increase of 1.0 FTE in the Division of Management and Administration, 7.3 FTEs in the Division of Visitor Services and Resource Management, and 2.0 FTEs in the Division of Maintenance. Table 2 summarizes the monument staff as proposed under the plan. Both existing (authorized) staff and the additions are indicated in the table. A description of the work to be performed by the additional staff is in appendix J.

Following acquisition of the Bandera Crater property, the private lands along NM 117, and the multiagency center site, reorganization of the monument will occur. Two districts will be established to provide protection and visitor service on both sides of the monument. The east district staff, responsible for the multiagency center and the eastern part of the monument, will live in Grants and have office space in the leased headquarters building along with other personnel serving the whole monument. Most west district personnel, responsible for the Bandera visitor center and the western portion of the monument, will be required to occupy the residences near Bandera Crater.

CARRYING CAPACITY AND IMPACT MANAGEMENT

Carrying capacity is a concept for estimating the level of a particular use that a unit of land can support without resource degradation. As applied to outdoor recreation areas, carrying capacity is the maximum theoretical level of visitation that a parkland could support before natural and cultural resources, including those resources that visitors will contact directly, would begin to be damaged.

General management planning for facilities, roads, and trails has proceeded with the intent of keeping visitors within nonsensitive areas and the assumption that the projections of relatively low visitor use are accurate. However, without determination of carrying capacities, unexpected growth in visitation could unacceptably change the quality of monument resources. El Malpais is a new national monument with relatively few impacts on resources in visitor use areas. Even so, based on experiences at similar units of the national park system, the monument's resource staff is beginning to hypothesize some of the types of damage that could occur at El Malpais without management intervention.[23] These impacts, as well as others that are predicted or become evident, will be assimilated into impact management practices described below and will evolve to fit the specific conditions of El Malpais.

Determination of a realistic carrying capacity for the monument and for particular places within the monument will emerge from an impact monitoring and management program. This program will determine the critical thresholds at which visitor use levels and development begin to harm environmental values and visitor enjoyment of those values; the program will also lead to future actions that ensure the preservation of the El Malpais environment.

Continual monitoring of visitor impacts, beginning with early establishment of baseline data, is the key to determining whether protective management is adequate and whether visitor use is impairing the very values – natural, cultural, and experiential –

23. For example, years of climbing cinder slopes in Sunset Crater National Monument, Arizona, damaged the landscape, and eventually this visitor activity had to be eliminated. There is strong presumption that such use at El Malpais would result in similar scarring, and the response is to manage cinder cone slopes for no public use.

TABLE 2: STAFFING REQUIREMENTS (INCLUDING EXISTING STAFF)

POSITION	GRADE	SALARY (1989 $)	FTE
DIVISION OF MANAGEMENT AND ADMINISTRATION			
Existing Authorized Staff			
Superintendent*	GM-13	$ 47,906	1.0
Administrative Officer	GS-09	29,456	1.0
Clerk Typist	GS-04	15,868	1.0
Clerk Typist (Seasonal)	GS-03	4,186	.3
Authorized Annual Total		$ 97,416	3.3
Additions to Staff			
Purchasing Agent	GS-07	$ 25,654	1.0
Total Increase		$ 25,654	1.0
Division Total		$ 123,070	4.3
DIVISION OF VISITOR SERVICES AND RESOURCE MANAGEMENT			
Existing Authorized Staff			
Chief Ranger*	GS-12	$ 41,607	1.0
Supervisory Park Ranger	GS-11	33,630	1.0
Resource Management Specialist	GS-09	29,456	1.0
Park Ranger (Interpretive Specialist)*	GS-09	29,456	1.0
Supervisory Park Ranger	GS-09	29,456	1.0
Park Ranger (Area Ranger)	GS-07	25,654	1.0
Park Ranger (Protection and Backcountry)	GS-05	17,752	1.0
Park Ranger (Protection)	GS-05	17,752	1.0
Park Ranger (Interpretation)	GS-05	17,752	1.0
Park Ranger (Seasonal)	GS-05	10,651	0.6
Park Ranger (Seasonal)	GS-05	8,876	0.5
Park Ranger (Seasonal)	GS-04	7,505	0.5
Park Ranger (Seasonal)	GS-04	7,505	0.5
Park Ranger (Seasonal)	GS-04	7,505	0.5
Authorized Annual Total		$284,557	11.6
Additions to Staff			
Resource Management Specialist (Fire/Veg.)	GS-07	23,455	1.0
Park Ranger (Interpretation)	GS-07	25,564	1.0
Park Ranger (General)	GS-05	17,752	1.0
Park Ranger (General)	GS-05	17,752	1.0
Park Ranger (General)	GS-05	17,752	1.0
Park Ranger (Seasonal)	GS-04	7,505	0.5
Dispatcher/Clerk	GS-04	15,868	1.0
Park Ranger (Seasonal)	GS-03	5,840	0.4
Park Ranger (Seasonal)	GS-03	5,840	0.4
Total Increase		$137,328	7.3
Division Total		$421,885	18.9

DIVISION OF MAINTENANCE

Existing Authorized Staff

Facility Manager*	GS-09	$ 29,456	1.0
Maintenance Worker	WG-07	22,129	1.0
Work Leader	WL-07	22,456	1.0
Maintenance Worker	WG-05	19,422	1.0
Maintenance Worker	WG-05	19,422	1.0
Seasonal Laborer	WG-03	7,760	0.5
Seasonal Laborer	WG-03	7,760	0.5
Seasonal Laborer	WG-03	7,760	0.5
Authorized Annual Total		$ 136,165	6.5

Additions to Staff

Maintenance Mechanic	WG-09	22,874	1.0
Maintenance Worker	WG-05	19,422	1.0
Total Increase		$ 42,296	2.0
Division Total		$178,461	8.5
MONUMENTWIDE TOTAL		**$723,416**	**31.7**
Total Increase Over Authorized Staff		$205,278	10.3

* Indicates staff who will have support duties for the Masau Trail.

that El Malpais is established to protect. Monitoring activities will be carried out routinely and thoroughly by staff with appropriate professional training. The Park Service will be responsible for initiating monitoring and impact-mitigating measures, but assistance from outside sources such as universities, agencies, foundations, and qualified volunteers will be used to the maximum extent possible, under NPS direction.

At first, the sites receiving most attention will be those where visitors congregate in largest number and/or that have resources that are most vulnerable to human impact. On a prioritized basis supported by resource condition monitoring, these principles of impact management will be expanded to additional areas.

The resource management plan (RMP) and other action documents will set forth in detail how resource monitoring and protection will actually be accomplished. The RMP for El Malpais will take advantage of available concepts and methodologies, such as *visitor impact management* (VIM) and *limits of acceptable change* (LAC), and will maintain the flexibility necessary to recognize that such methodologies are themselves evolving. The objectives of impact management will include the maintenance of a quality human experience that takes visitor expectations, interactions, and opportunities for solitude and natural quiet into account as well as the protection of natural and cultural resources.

Finally, visitors themselves, although the source of many impacts, would likely be enthused about helping to protect monument resources – provided they know the reason behind the restrictions and are familiar with rules of conduct in the environment. Therefore, the interpretive program at El Malpais will be coordinated with the impact management program as a critical tool in educating visitors about resource-conscious use.

The plans of other units in the national park system, such as Arches National Park in Utah, are committed to impact monitoring and management to meet the challenges of increasing visitor use. Appendix K summarizes the portions and examples in the 1989 Arches *General Management Plan/ Development Concept Plan* that seem to relate to El Malpais.

FUTURE PLANS AND STUDIES

In addition to the plans and studies that have already been described, the following are needed and will be initiated under this plan.

Visitor Center Facility Plan

The NPS Harpers Ferry Center will prepare facility plans concurrently with the preparation of the comprehensive design for the multiagency center and the Bandera visitor center. This will ensure that the buildings and their interpretive contents, such as exhibits and audiovisual media, are compatible, nonrepetitive, and functional and that they address the needs of mobility, sensory, and mentally impaired persons.

Monumentwide Sign Plan

A sign plan will be prepared by the monument staff in consultation with the Bureau of Land Management to ensure a common appearance and format for signs used in both the monument and conservation area. Monument signs will be in conformance with NPS sign standards and will be compatible with the natural features of the area, yet easily visible from roads and trailheads. Sign messages will be clear, concise, and quickly understood. Regardless of the message conveyed, each sign will be recognized as an El Malpais National Monument/National Conservation Area sign. The sign plan will be prepared before the wayside exhibit plan described below so that exhibit planners can follow monument sign standards.

Wayside Exhibit Plan

A wayside exhibit plan for both the monument and the conservation area will be prepared by the NPS Harpers Ferry Center in consultation with NPS and BLM staff and regional and state offices. These entities will coordinate efforts to avoid a piecemeal approach to interpretation. Wayside exhibits and signs will be designed to create a visual similarity (continuity of design that can be easily identified by visitors) that will reinforce the fact that the national monument and national conservation area are both part of El Malpais.

Media Plans/Special Considerations

A recurrent theme presentation at El Malpais centers on the world views of other cultures. All stages of media production for audiovisual products, indoor exhibits, wayside exhibits, and publications associated with this theme will be developed in consultation with tribal representatives. American Indian involvement will begin during the initial research.

Visitor Expenditure Patterns

There is a need to understand the expenditure patterns of visitors to El Malpais National Monument. It is especially important to determine the impacts of these expenditures on surrounding communities. A generalized economic impact assessment methodology is currently under development for the National Park Service. The methodology is being tested at Great Basin National Park (Nevada), another recent addition to the national park system. The methodology includes generation of baseline data, prediction of impacts, and measurement of actual economic impacts over time and is intended to be applicable in other parks. Management should consider implementing an economic impact study using this methodology at El Malpais as soon as the monument becomes fully operational.

Carrying Capacity Studies

As noted in the section on carrying capacity, there is a need to collect additional baseline resource and visitor use data as soon as possible. This data will allow management to more accurately assess the ability of resources to withstand impacts associated with visitor use and ensure maintenance of quality visits to the national monument.

Condition Assessment Report

As noted under the description of Las Ventanas, a condition assessment report will be done to determine the most appropriate way of preserving the structure. This report will include a full range of alternatives, including no action in regard to the fill, retention but modification of the fill to improve its long-term protective and aesthetic qualities, and varying degrees of fill removal to improve interpretive potential. See description of Las Ventanas in the "Visitor Facilities/Development Plan" section for further details of the contents of this report.

DEVELOPMENT PRIORITIES AND COSTS

The phasing and estimated costs of development are summarized below. These estimates are gross costs (construction cost plus project planning, construction supervision, and contingencies) and are in 1989 dollars. More detailed cost estimates are provided in appendix L. The general order of rationale for prioritizing developments as well as meeting other objectives for the monument is to

- meet legislative requirements for developing visitor services
- meet needs for public life, health, and safety
- consult with American Indians on matters of access, development, interpretation, and protection of resources
- promote the orderly phaseout of grazing by the end of 1997
- identify fragile and significant resources requiring special management
- create the necessary infrastructure for providing a full spectrum of visitor opportunity
- provide staff-related facilities to support resource and visitor protection
- cooperate with the Bureau of Land Management in taking the actions needed to manage both the national monument and conservation area

Development priorities for the 13 areas were developed by the planning team, with input by monument managers. The specific development actions at each area are shown in order of priority. However, some items may not be developed in the literal order shown in the entire list. Many factors, including land acquisition and availability of road and other construction funding, also affect the eventual order of development.

Table 3: Development Priorities and Costs

	$ (in thousands)
1. Bandera Crater Area	
• adapt trading post complex for NPS visitor purposes	$ 174
• upgrade trails to Bandera Crater, Ice Cave, and lava surface features, including wheelchair-accessibility features	232
• construct entrance and one-way tour road, visitor center, parking for visitor center and trading post, utility systems, and visitor center nature trail and parking	7,565
• construct maintenance and residential area roads, buildings, and utilities	2,294
• develop remaining trails (Spattercone Valley, Cerro Bandera, connectors, etc.)	334
• recontour and restore cinder and borrow pits to natural appearance	312
2. Multiagency Center	
• construct utilities, entry road, parking, and visitor center	3,347
• develop trail	32
3. Dripping Lava Cave	
• construct parking between tour road and lava features	81
• develop trail to cave, stairs, and trail inside cave	183
• develop trail to Lava Crater	17
4. El Calderon	
• close and revegetate south end of Bat Cave road; construct new gravel road to within 1/4 mi. of Bat Cave	321
• construct gravel parking, vault toilets, trailhead, and trails to Bat Cave, Double Sinks, and Junction Cave	118
• improve El Calderon Road for through-traffic to south	484
• close and revegetate portions of Corral road	119
• designate viewing area for bat flights	1
5. Sandstone Bluffs/Las Ventanas	
• pave Sandstone Bluffs road and redesign parking; construct vault toilets, provide lockable gate	2,157
• develop short trails to overlook, including wheelchair-accessible trail	14
• construct paved spur road to Las Ventanas parking/trailhead	130
• develop trail to natural arch and Las Ventanas sites	52
6. East Rendija Trailhead/Cerro Bandera	
• realign Route 42 (first 2.0 mi.) and upgrade route leading to East Rendija to a gravel standard; construct parking and vault toilets at East Rendija	1,958
• construct trailhead and trails to Big Skylight and Four-Window caves; mark primitive trails to Seven Bridges and Caterpillar collapses	66
• construct Cerro Bandera parking, trailhead, and trail to summit	71
• revegetate closed portion of previously used Route 42 (east of Cerro Bandera)	78
• construct gravel roadside parking, trailhead, and loop trail to lava wall	50

7. The Narrows	
• construct parking and short trail	119
• mark trail onto McCartys flow	22
8. Zuni-Acoma Trail (west end)	
• construct wheelchair-accessible parking spaces and trail to overlook	6
• rehabilitate gravel parking area and spur road	3
9. Acoma-Zuni Trail (east end)	
• construct parking area and trailhead	131
10. East Rendija Campground	
• construct spur road, campsites, vault toilets	416
TOTAL (in thousands)	**$ 20,887**

PLAN SUMMARY

The following table summarizes the various development actions of the plan.

TABLE 4: SUMMARY OF DEVELOPMENT

Multiagency Center, Grants

Construct handicap-accessible orientation/ information center for travelers; develop short trail

Construct paved access road from I-40

Construct paved parking area

Bandera Crater/Lava Crater Area

Construct new handicap-accessible visitor center with paved parking area east of Sandstone Ridge

Construct paved two-way access from NM 53 to new visitor center; continue road as one-way paved tour road to new parking area near trading post and an exit onto NM 53.

Adaptively reuse trading post; two of the cabins reused as restrooms and one will be restored as early tourist cabin; remove noncontributing structures; maintain rails and part of existing cinder parking lot

Construct new trailhead and trails to Dripping Lava Cave and Lava Crater

Develop interconnecting trails to Sandstone Ridge, Spattercone Valley, Cerro Bandera, and other lava features

Interpret and make trail to Ice Cave wheelchair-accessible; develop wheelchair-accessible trail to nearby lava surface features; interpret Bandera Crater trail

Provide picnic tables near trading post, at least one wheelchair-accessible

Construct four single-family residences, four-unit apartment, four-bay maintenance building, access road, parking, and utilities east of new visitor center

Recontour and restore cinder and borrow pits

East Rendija Area

Develop new trailhead and trail to top of Cerro Bandera (from spur off realigned portion of Route 42)

Gravel 6-mile access, with realignment of first 2 miles; elevate road; close and restore first 2 miles of existing road

Construct six-site (expandable to meet demand) primitive campground; no water

Develop parking area and short interpretive trail to lava wall

Formalize and gravel parking at East Rendija; develop new trailhead

Provide vault toilets at campground and trailhead

Develop trails to Big Skylight and Four-Windows caves; mark route to Seven Bridges and Caterpillar collapses

Braided Cave

Use existing access road and unimproved dirt parking area

Mark route to Braided Cave

El Calderon Area

Gravel existing road to Junction Cave; construct new gravel road to new gravel parking .3 mi from Bat Cave; provide vault toilets

Develop trails to Bat Cave and Double Sinks from parking area, short trail to Junction Cave, and trail between Junction Cave and Double Sinks

Close east tube of Bat Cave but allow viewing of flights; west tube exploration not encouraged

Close Corral road when necessary improvements are made on El Calderon road for through traffic; restore portions of Corral road when closed

Zuni-Acoma/Acoma-Zuni Trail

Use existing gravel road on west end; redesign existing parking; make trail to viewpoint wheelchair-accessible

Provide paved roadside parking and trailhead on east end

Las Ventanas

Construct new paved spur road and paved parking area off Sandstone Bluffs road

Develop trailhead and trail south along ridge to include natural arch, viewpoints, roomblock, tower kiva, great kiva, and prehistoric road

Close Las Ventanas/Sandstone Bluffs road at night

Sandstone Bluffs Overlook

Realign and pave existing road; redesign and pave existing parking area; provide wheelchair-accessible vault toilets near parking

Develop two trails to two overlooks, one trail being wheelchair-accessible

Install lockable gate near NM 117

The Narrows

Provide parking area for about six vehicles

Develop short trail onto adjacent lava

Roadside Kiosk along NM 117

Construct orientation/information kiosk with paved parking along NM 117 at south boundary of national conservation area

WILDERNESS SUITABILITY STUDY

WILDERNESS SUITABILITY STUDY

INTRODUCTION

The purpose of wilderness designation, which is accomplished solely by congressional action, is to preserve and protect wilderness characteristics and values over the long term while providing opportunities for solitude and unconfined recreation. With passage of the 1964 Wilderness Act (16 USC 1131 et seq.), Congress declared that it is national policy to secure for present and future generations the benefits of enduring wilderness resources.

Section 501.(c) of the El Malpais legislation states that, "The general management plan for the monument shall review and recommend the suitability or nonsuitability for preservation as wilderness of all roadless lands within the boundaries of the monument." The purpose of this study, then, is to evaluate and identify monument lands that possess wilderness characteristics as defined in the Wilderness Act and NPS *Management Policies*.

Although Congress could now act on the suitability findings in this document and any other information it chooses, the usual procedure in government would be for the Park Service to conduct a formal wilderness study, including an environmental impact statement, prior to the Executive Branch making an actual recommendation on wilderness.

WILDERNESS DEFINITION

The Wilderness Act describes and defines a wilderness area as follows:

> A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in the Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

CRITERIA FOR WILDERNESS

Chapter 6 of the NPS *Management Policies*, "Wilderness Preservation and Management," states that wilderness includes

> lands and waters found to possess the characteristics and values of wilderness, as defined in the Wilderness Act
>
> lands that have been logged, farmed, grazed, or otherwise utilized in ways not involving extensive development or alteration of the landscape. (These lands will be considered for wilderness if at the time of study the effects of these activities are substantially unnoticeable or their wilderness character could be restored through appropriate management actions.)

The policies continue to say that lands will not be excluded from wilderness because of the following:

> Management practices require the use of tools, equipment, or structures if those practices are necessary for the health and safety of wilderness travelers or protection of the wilderness area.
>
> The lands contain prior rights or privileges, such as livestock grazing and stock driveways, provided these operations do not involve the routine use of motorized or

mechanical equipment and do not involve development and structures to such an extent that the human imprint is substantially noticeable.

An area possesses mineral rights and may be subject to exploration and development if it is likely that the mineral rights will be relinquished, acquired, exchanged, or otherwise eliminated in the foreseeable future.[24]

The lands contain underground utility lines if these lines do not require the routine use of mechanized and motorized equipment. (Areas containing aboveground utility lines do not meet wilderness criteria.)

There are historic features in an area that attract visitors primarily for the enjoyment of solitude and unconfined recreation. (An area will not qualify if it contains historic features that are considered primary visitor attractions.)

Section 501(c) of the "El Malpais Senate Report," July 6, 1987, provides further guidance. The report states that

> It is the intention of the Committee that the National Park Service apply the same criteria for determining which lands are 'roadless' as would be applied by the BLM; that is, the definition of 'road' found in the BLM's wilderness inventory policy should be used.

The Bureau of Land Management defines a "road" as "a vehicle route which has been improved and maintained by mechanical means to ensure relatively regular and continuous use." The BLM definition of a "way" is "a vehicle route which has not been improved and maintained by mechanical means to ensure relatively regular and continuous use." Therefore, areas of the monument containing vehicular "ways" as defined by the Bureau of Land Management are considered "roadless" by the intent of the Senate report.

The monument contains several vehicular routes that clearly meet the definition of a "way," which classifies these areas as "roadless." The ways were created to provide backcountry access for early timber and livestock grazing operations. These routes are a significant resource problem (see "The Plan for Natural Resource and Wildlife Management" section), resulting in compacted soil and erosion problems. The ways serve no particular purpose except to provide infrequently used routes for backcountry visitors. Some are nonroutinely used by ranchers for maintaining livestock grazing operations. As previously stated, this commercial grazing, which is authorized by Congress, will be discontinued after December 31, 1997.

INTERIM MANAGEMENT OF SUITABLE LANDS

All lands determined suitable for wilderness designation will be managed under the provisions of the Wilderness Act and NPS policies to maintain wilderness characteristics and values. Interim wilderness management will continue until designation by Congress.

Section 501.(c)(2) of the El Malpais establishing legislation states

> Pending the submission of a recommendation and until otherwise directed by Act of Congress, the Secretary [of the Interior], through the Director of the National Park Service, shall manage all roadless lands within the boundaries of the monument so as to maintain their potential for inclusion in the National Wilderness Preservation System.

BRIEF DESCRIPTION OF THE STUDY AREA

A large portion of the monument is covered by lava fields, which, along with the limited availability of water, have historically restricted human access

24. The establishing legislation for the monument provided for BLM exchange of state and privately owned subsurface interests under federally owned lands including the monument. All state subsurface exchanges have been completed. Private exchanges are continuing. Interests yet to be acquired are shown on the Wilderness Suitability map. More detailed information can be found in the El Malpais *Land Protection Plan* (NPS 1990b).

and development and limited the exploitation of resources.

In contrast, the more accessible grass/shrubland and forested areas along the lava flow margins have historically been used and contain most of the evidence of historic development. These areas contain national and regional transportation routes including US 40, NM 117, NM 53, and Route 42; they have also been heavily grazed and, in the northwestern portion of the monument, heavily timbered. Most visual intrusions in the monument are associated with these activities and include roads and ways, buildings, overhead power and telephone lines, earthen and metal stock tanks, fences, windmills, and corrals.

The monument is bordered on two sides by designated wilderness areas – the 60,000-acre Cebolla Wilderness to the southeast and the 38,210-acre West Malpais Wilderness to the southwest. Additionally, the 17,468-acre Chain of Craters Wilderness Study Area, approximately 2.5 miles west of the monument, is under study for possible wilderness designation. All of these areas are in the national conservation area and are managed by the Bureau of Land Management.

WILDERNESS SUITABILITY

Using the wilderness criteria previously described, an evaluation of the monument was conducted by the Park Service, and approximately 97,428 acres or almost 85 percent of the monument was found to possess wilderness characteristics and values (see Wilderness Suitability map). The suitable areas contain no permanent improvements, have only minor human impacts, and provide outstanding opportunities for solitude and unconfined recreation. They also contain important ecological, geological, archeological, educational, scientific, scenic, or historic resources. Other acreages identified as suitable are the areas outside the flow margins along the southwestern monument boundary that adjoin the West Malpais Wilderness Area, forming an adjacent NPS/BLM wilderness boundary. No lands were determined to be unsuitable for wilderness designation solely because of grazing or livestock-related facilities. In several places, the margins of the McCartys, Hoya de Cibola, Bandera, and Twin Craters flows were used to delineate wilderness-suitable areas.

Certain areas along the NM 117 corridor require additional study. These are the areas where the monument boundary lies outside the margins of the flows, and the areas outside these margins have not been determined suitable for wilderness in this study. The ecotone zones and the roads needed permanently for management and American Indian access have not yet been determined in these areas. This missing information will be collected and considered in formulating alternatives for the future wilderness study that must take place before wilderness can be formally recommended. In accordance with policy, this study will be accompanied by an environmental impact statement.

Monument lands that do not possess wilderness qualities and values and have been determined unsuitable for wilderness designation include approximately 17,420 acres or 15 percent of the monument. These areas include the following:

The 442.6-acre noncontiguous multiagency center site just south of I-40 near Grants – This site does not meet wilderness criteria because of nearby development and small size.

Approximately 152 acres of lands adjacent to roadways – Setbacks in these areas define the wilderness suitability boundary. The setbacks limit visual and audible intrusions while allowing for road improvements and realignments. The setbacks will vary with the type and standard of road, including 300 feet from centerline of paved roads, 100 feet from centerline of high-standard dirt or gravel roads, and 30 feet from centerline of low-standard dirt roads.

The road corridor to Cerro Encierro, which encompasses approximately 17 acres – This road provides administrative and public access to the monument's otherwise inaccessible southwestern Hoya de Cebola lava flow. The road is necessary for fire, search-and-rescue, and resource management operations. It also provides a back-country motorized recreational opportunity (as described in the "Visitor Facilities/ Development Plan" section) that is unavailable elsewhere in the monument. The road is maintained by mechanical means on an annual basis.

The road corridor to Lost Woman Crater, which encompasses approximately 16 acres – This road provides management/ administrative access to the east side of the Bandera flow and is necessary for fire, search-and-rescue, and resource management operations. Although open for access to private lands, this road will not be open for vehicular use by the public. The road is maintained by mechanical means on an annual basis.

Approximately 17,195 acres including development sites such as Bandera Crater, East Rendija, El Calderon, Sandstone Bluffs, Las Ventanas, the Zuni-Acoma/Acoma-Zuni trailheads, and the Narrows – This acreage also contains most of the roads that provide motorized access for monument protection and management (except for Cierro Encierro and Lost Woman, described above), American Indian subsistence and religious purposes, and ranching operations (to be discontinued by 1998).

POTENTIAL WILDERNESS ADDITIONS

Potential wilderness lands are those areas surrounded by or adjacent to wilderness that meet the criteria and would be suitable for wilderness designation if in federal ownership. However, because these lands are not currently in federal ownership and because federal acquisition of these private lands may not occur for a long time, these lands are identified as potential wilderness additions for the purposes of this study only. The Park Service will try to work cooperatively with these landowners to protect the wilderness qualities of their lands. Within the boundaries of El Malpais National Monument there are approximately 18,500 acres of nonfederal lands, 11,161 acres of which are potential wilderness additions (see Wilderness Suitability map).

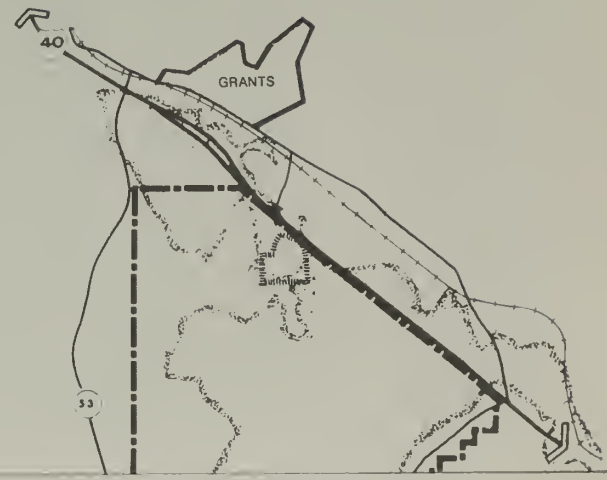
IMPLICATIONS OF MANAGING LANDS IDENTIFIED AS SUITABLE FOR WILDERNESS[25]

As previously described, all lands that have been found suitable for wilderness designation will be managed as wilderness until such time as Congress specifically designates wilderness at El Malpais National Monument. This entails the closure of all ways and ensures no use of motorized or mechanical equipment, including mountain bikes, motorcycles, and chain saws (by both visitors and monument staff). Travel will be by foot, horseback, or pack animal only. Caves with entrances in wilderness-suitable land will be managed as wilderness. Also, development within suitable wilderness will be limited to the those facilities determined necessary to carry out the objectives as defined in the Wilderness Act and NPS *Management Policies*. The construction of facilities incompatible with wilderness values or management objectives will be prohibited. (The existing intrusive and incompatible livestock ranching developments will be removed following discontinuation of grazing on December 31, 1997, provided that none of the structures are determined historic.)

Travel within the areas suitable for wilderness will be more difficult and require greater planning and effort. Elimination of routine mechanized and motorized usage will not be an inconvenience to livestock operators because existing ranching operations do not require routine mechanized or motorized use within areas determined to be suitable for wilderness.

The establishing legislation states that traditional American Indian practices may continue in El Malpais, consistent with the Wilderness Act. The Wilderness Act excludes use of motorized vehicles and equipment in wilderness areas, and nonexclusive access will be by foot, horseback, or other types of pack animals. Certain locations within the areas suitable for wilderness may be periodically closed to the general public for short periods for American Indian purposes. (Coordination with the superintendent will be necessary to arrange such closures.) Otherwise, there are no important differences in the ways

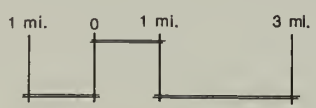
25. Management zoning, described earlier, restricts many of the same activities and uses that the designation as wilderness suitable restricts (see appendix C).



WHITE AREAS WITHIN MONUMENT BOUNDARY HAVE BEEN IDENTIFIED AS UNSUITABLE. PRIVATE OWNERSHIPS (SURFACE AND SUBSURFACE) ARE NOT SHOWN IN THESE AREAS. FOR AN ACCURATE PORTRAYAL OF ALL NONFEDERAL INTERESTS IN THE MONUMENT SEE THE MONUMENT'S LAND PROTECTION PLAN.

LEGEND

- NATIONAL MONUMENT BOUNDARY
- NATIONAL CONSERVATION AREA BOUNDARY
- WILDERNESS-SUITABLE LAND
- POTENTIAL WILDERNESS ADDITIONS
- PRIVATE SUBSURFACE OWNERSHIP
- PRIVATE SURFACE OWNERSHIP
- PRIVATE SURFACE/SUBSURFACE OWNERSHIP

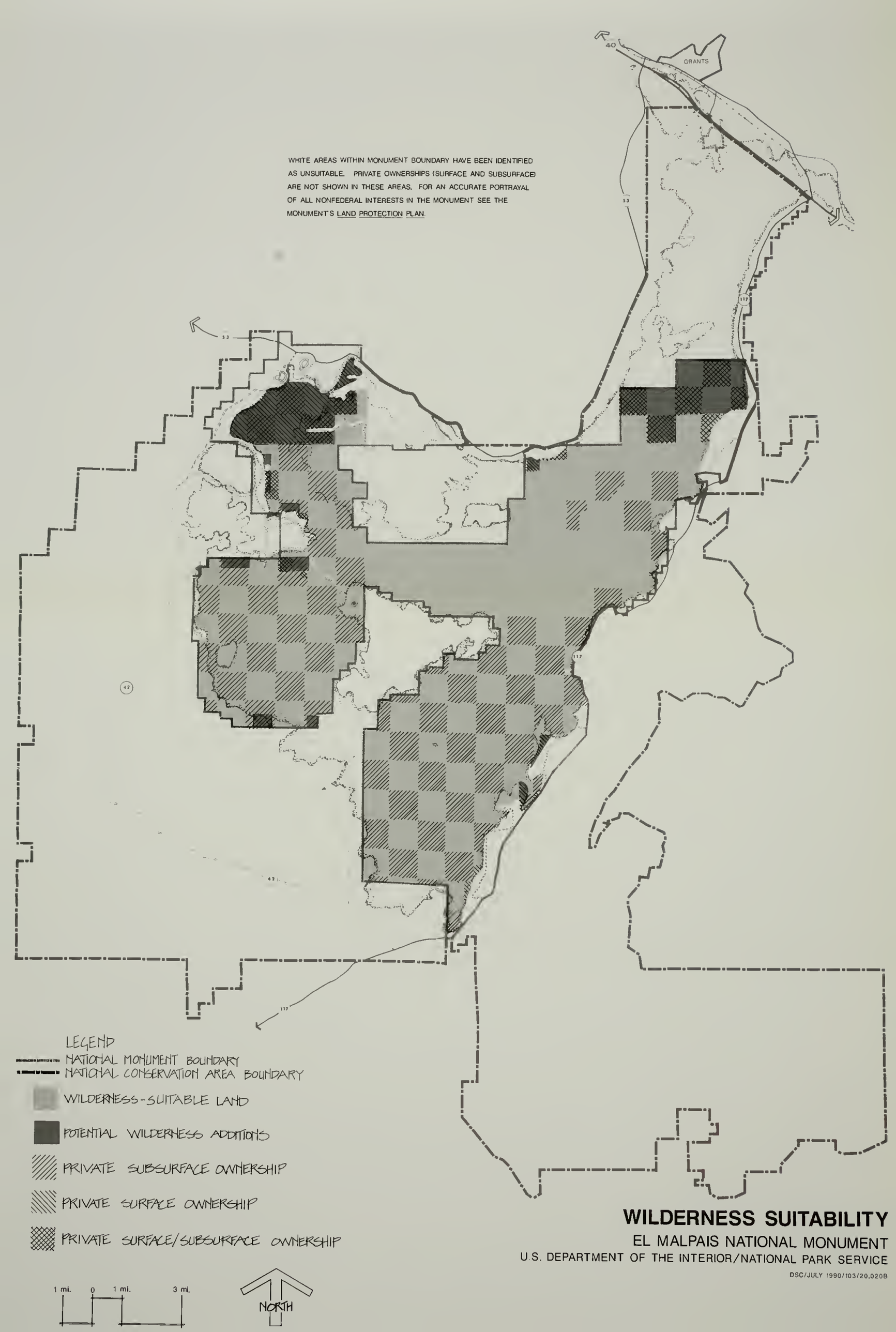


WILDERNESS SUITABILITY

EL MALPAIS NATIONAL MONUMENT

U.S. DEPARTMENT OF THE INTERIOR/NATIONAL PARK SERVICE

DSC/JULY 1990/103/20,020B



WILDERNESS SUITABILITY

EL MALPAIS NATIONAL MONUMENT

U.S. DEPARTMENT OF THE INTERIOR/NATIONAL PARK SERVICE

DSC/JULY 1990/103/20,020B

American Indians may use lands suitable for wilderness in the national monument. It should be noted that, with few exceptions, most of the area suitable for wilderness has no roads, so designation as wilderness-suitable lands should not change traditional use patterns.

Research scientists who were required to camp in wilderness-suitable areas for prolonged periods would be required to accept primitive camping conditions and use of minimum equipment. Scientists wanting to inventory and conduct other research activities, including those associated with archeology, would be restricted in their scope of work. This would include the requirements that their projects would be allowed only if there is no other alternative to their research in wilderness-suitable areas and their projects would not interfere with other uses except for short duration. Electronic monitoring devices to protect cultural resources would be allowed only if determined to be the minimum necessary tool.

The Park Service would provide public information and interpretation about wilderness values, fostering an appreciation of these values. Visitors thus would be required to accept the land largely on its own terms, accepting certain risks that are inherent to primitive recreation (including potential danger from adverse weather and extremely rugged terrain). NPS interpretation and safety information would partly mitigate these hazards.

As described in the natural resource and wildlife management section, a wilderness management plan will be developed by the superintendent to guide the preservation, management, and use of the area. The plan will be developed with public involvement and will contain specific, measurable wilderness management objectives for the preservation of wilderness values as specified in the Wilderness Act and NPS *Management Policies*.

There may be a slight increase in the number of visitors seeking wilderness recreation experiences; however, this increase will not significantly benefit the local economy or add to the region's recreation opportunities.

Wilderness designation, and in this case determination of lands suitable for wilderness, will help ensure long-term perpetuation of wilderness resources and values while providing opportunities for solitude and unconfined recreation. The elimination of vehicles will allow for restoration/reclamation of disturbed areas, enhance wilderness values, and increase the opportunity for solitude. For those who choose to hike or journey by horseback, opportunities for unconfined recreation will be greatly enhanced.

CONCLUSION

Most of El Malpais National Monument lands have been found to possess wilderness characteristics and values. This amounts to 97,428 acres or almost 85 percent of the monument. This total includes potential wilderness additions (wilderness-suitable nonfederal lands as described above).

Based on the analysis of the suitability criteria, the following four categories of land in El Malpais National Monument have been identified with respect to wilderness suitability (see Wilderness Suitability map):

Suitable federal lands	approximately	86,267 acres
Wilderness additions (suitable nonfederal lands)	approximately	11,161 acres
Total suitable lands		**97,428 acres**
Unsuitable federal lands	approximately	10,031 acres
Unsuitable nonfederal lands	approximately	7,389 acres
Total unsuitable lands		**17,420 acres**
Total monument land		**114,848 acres**

ORGANIZATIONS CONTACTED

The following organizations were sent a copy of the draft plan. Those organizations with an * sent written responses to the draft plan.

Federal

Advisory Council on Historic Preservation*
Bureau of Land Management, Rio Puerco and Santa Fe Offices
U.S. Fish and Wildlife Service, Albuquerque
U.S. Forest Service
Southwest Regional Office
Cibola National Forest
Apache National Forest

State

Albuquerque Convention and Visitors Bureau
Albuquerque Department of Economic Development
New Mexico Department of Game and Fish, Santa Fe Office
New Mexico Economic Development and Tourism Department
New Mexico Energy, Mineral, and Natural Resources Department
New Mexico Energy, Mineral, and Natural Resources Department, Parks and Recreation Division
New Mexico State Highway and Transportation Department
New Mexico State Historic Preservation Office
New Mexico State Tourism Office
University of New Mexico, Bureau of Business and Economic Research

County

Cibola Convention and Visitor Bureau

City

City of Grants
Gallup Chamber of Commerce
Greater Grants Chamber of Commerce*

Indian Tribes

Pueblo of Acoma
Pueblo of Laguna
Pueblo of Zuni
Ramah Navajo Chapter

Other

Continental Divide Trail Society*
Quivera Research Center*
National Parks and Conservation Association*
National Speleological Society*
New Mexico Wilderness Coalition*
New Mexico Wilderness Study Committee*

SUMMARY OF PUBLIC INVOLVEMENT

SUMMARY OF PUBLIC INVOLVEMENT ON THE DRAFT *GENERAL MANAGEMENT PLAN*

WRITTEN RESPONSES TO DRAFT *GENERAL MANAGEMENT PLAN*

Written responses to the draft *General Management Plan* included letters from 13 individuals and eight organizations – the Advisory Council on Historic Preservation, the Continental Divide Trail Society, the Greater Grants Chamber of Commerce, the National Parks and Conservation Association, the National Speleological Society, the New Mexico Wilderness Coalition, the New Mexico Wilderness Study Committee, and the Quivera Research Center. Of the letters received, six respondents offered general impressions of the plan, one found the overall plan very general and vague, and four complimented the preparers on the quality of writing and organization or on the balanced approach to use and preservation. Specific issues brought to the Park Service's attention in the letters are addressed below in the general order the topics are addressed in the text of the plan.

Multiagency Center

One respondent stated that the multiagency center should be in Grants rather than on I-40, citing as reasons improvement of Grants' depressed economy, availability of choice land on Santa Fe Avenue, and amenities in town such as the new river walk.

The site for the proposed center, adjacent to I-40 as provided by the El Malpais legislation, offers easy and well-defined access for interstate visitors. The facility is intended as an information center for all of western New Mexico and also for the Masau Trail, which includes even a larger region. Also, the building will stand out singularly from adjacent development on land protected for that purpose. The center will remain as proposed in the draft plan.

Dripping Lava Cave Spur Road

One respondent wrote in opposition to constructing a spur road leading to a trailhead for Dripping Lava Cave and Lava Crater, citing vehicular congestion and keeping the area southeast of the lava flow in natural condition.

The spur road proposal has been deleted from the final plan to eliminate costs and impacts of constructing this 0.3-mile road. The lava flow is a natural barrier separating vehicular use on the tour-road side from the more tranquil environment on the cave and crater side. In addition, the slightly longer walk to Dripping Lava Cave is appropriate considering the steep, strenuous descent into the cave. Trailhead parking will be provided adjacent to the tour road, as described in the revised text and shown on the Bandera Crater DCP.

County Route 42

Six letters addressed the proposed realignment and upgrade of this graded access road. One opposed realignment of the northernmost 2 miles because of damage to vegetation, including old juniper trees west of Cerro Bandera, and the monetary cost of relocation. Two questioned or opposed the improvement from dirt to gravel in general, citing the impacts that increased visitation would have on resources. Three supported the realignment and/or upgrade of standard, with rationale such as reduced impact to the environment and improved safety.

The proposal to realign the northernmost 2 miles of Route 42 has not been changed because of the following:

> The road will be moved to a less sensitive environment, allowing restoration of an unusual variety of plant and animal species along 1.6 miles of the ecotone on the edge of the Bandera flow. Also the road will be removed from the meadow just south of NM 53, improving this wildlife habitat area.
>
> Sight of vehicles and their dust along the road will be eliminated from view of visitors on the popular Bandera Crater and new Cerro Bandera trails.

The realigned road will be on the west side of Cerro Bandera where there is room for parking and a trail can be developed to a summit viewpoint.

The new section of road, instead of being constrained by terrain, will have curves and grades designed for safety and will be less costly to maintain.

The beginning of the road should be in a safer location on NM 53; the existing intersection has poor sight distance relative to a curve on the highway.

The proposal to upgrade the northernmost 6 miles of Route 42 to a gravel standard has not been changed because of the following:

The roadway will be improved overall in safety.

Drivers will be more likely to stay on a passable, well-defined roadway, especially in former mudhole areas, thereby reducing environmental damage.

Visitors in low-clearance vehicles will be able to reach and return from the campground and East Rendija trailhead during wet weather.

Access will be improved for management and patrol, and for emergency operations (medical, fire, and search-and-rescue).

Bat Cave/Bat Research

Four respondents addressed management and public use of Bat Cave in the El Calderon area. One supported the draft plan as well conceived. One questioned that improved public access should be proposed to Bat Cave before an ecological study and consultation with international bat expert Dr. Scott Altenbach occurs. One expressed personal interest in designing the proposed baseline study for Bat Cave, suggested extension of such studies to other caves with sensitive life forms, offered a taxonomic update on threatened and endangered bats, and proposed admittance of scientists to Bat Cave in winter. One urged that the west tube of Bat Cave remain open.

Dr. Altenbach and cave specialists from Carlsbad Caverns have met with monument officials in the El Calderon/Bat Cave area and have rendered opinions that the plan for visitor use should not impact the bat populations involved. However, Dr. Altenbach stated that further studies should be performed to determine the exact impacting influences on the Bat Cave population. The draft and final plans state that if the baseline biological study proposed for Bat Cave demonstrates public viewing has an adverse effect, the access would not be improved. Corollary to this, public viewing itself might also be managed more stringently to protect the bat population. Although the plan does not propose to close the west tube of Bat Cave, it does state that public entry will not be encouraged. The proximity of the west tube to the east tube (occupied by the bats) is still a concern and is subject to scientific investigation and possible protective action.

Changes have been made in this final plan to indicate that baseline inventories and monitoring will be conducted in accord with the Federal Cave Resource Protection Act for all significant caves in the national monument, including those to be visited by the public. The Park Service will consider the input of qualified specialists in designing the studies, and the Park Service has every intent to allow scientific investigations to proceed in Bat Cave and all other resource areas of the national monument.

Las Ventanas

Two letters supported option 1, retention of the protective fill that covers the tower kiva at Las Ventanas, rather than option 2, which would remove it.

The significance of las Ventanas Chacoan Archeological Site to the national monument is established in Public Law 100-225. The decision as described in the draft plan is to provide access by trail and to interpret this resource. The Park Service does not have enough information to choose between options 1 and 2. The method of exhibiting the tower kiva will be determined by a detailed study that determines how this ruin will be preserved (see revised text in "Visitor Facilities/ Development Plan" section). This study will include different treatment alternatives and will require consultation with the State Historic Preservation Office, American Indians, and others.

Sandstone Bluffs

Three respondents addressed the draft plan proposals for the Sandstone Bluffs area. One urged that the new spur road/parking area for the proposed Las Ventanas trailhead be relocated closer to the Sandstone Bluffs road; this letter also proposed a pullback of the existing parking for the overlook, also for the reason of reducing the impacts of vehicles on visitors along the rim. The second respondent urged protection of biotically fragile tinajas (water pools) by keeping the trails at some distance. The third suggested keeping the road open in the evenings so people could enjoy sunsets.

The proposed site of the parking area for the Las Ventanas trailhead has been relocated about 0.2 mile closer to the Sandstone Bluffs road to reduce sight and sound of vehicles in the immediate rim area. The parking site will be in a low area to further minimize sight and sound impacts.

Proposed parking for the main overlook will remain in its present location. The parking area is already disturbed by that use and is designed for efficient circulation and parking.

The final plan, consistent with the draft plan, proposes no trails along the rim between Sandstone Bluffs and the proposed trail to Las Ventanas. This ensures a high order of protection for tinajas in that area.

The proposal to close the road at night has not been changed – to help protect Las Ventanas and other archeological sites from nighttime incursion. Also, unless the Park Service builds extensive safety rails at Sandstone Bluffs overlook, which would be a visual intrusion, the overlook would not be safe for nighttime use.

In addition to a short trail to the main overlook at the bluffs as proposed in the draft plan, a wheelchair-accessible trail to a second viewpoint will be provided next to handicap parking spaces that will be marked at the east end of the parking areas (see Las Ventanas/Sandstone Bluffs DCP).

The Narrows

Six letters addressed the proposal for a parking area and a trail onto the McCartys flow at the Narrows. One letter supported the proposal but requested visual sensitivity in the design of the handicap-accessible ramp. The other five letters opposed the proposal, stating as reasons the impact of the parking area and trail as a visual intrusion for visitors on the BLM's trail on the rim above the Narrows area and a perception that the Park Service was not properly concerned about the impacts of the future use and design of NM 117.

One letter stated that the environmental consequences section of the NPS draft plan had totally ignored the impact the Narrows development would have on the BLM's wilderness rim trail, and said that this strongly suggests that the legally mandated cooperative planning between the two agencies has not been adequately implemented. However, the plan did address this impact on page 162, "the new parking area and trail could be a visual intrusion from the proposed BLM overlook on the cliff above the site."

McCartys flow, probably the most recent eruption in New Mexico, is extremely fresh in appearance and lacks the weathered surfaces and denser forests of other flows in the monument. In some places, the lava exhibits pressure ridges, squeeze-ups, ropy pahoehoe textures, and other surface features in profusion – striking visual evidence of the original molten character. Because one of the two specific purposes of the monument is its nationally significant lava flows and because the McCartys surfaces contrast so distinctively from those of other flows, the planning team attempted to offer structured and interpreted foot access onto the flow in balance with opportunities provided elsewhere onto flows that are older and different in their surface characteristics. Because of many constraints related to parking space, ownership of land, and natural and ethnographic resources, it was difficult to select a place for the public to have an experience on the McCartys flow, especially a place with exemplary surface features. North of the mid point of the 2-mile-long Narrows there are far fewer pressure ridges and squeeze-ups – features that make the flow distinctive.

During planning the team investigated numerous areas of the McCartys flow near NM 117. The NPS and BLM teams spent time in the field together discussing the pros and cons of some of the sites in relation to the constraints described above, but it was later that the Park Service team discovered and proposed the site indicated in the plan, 0.3 mile

north of the south end of the Narrows (not in the middle). Following release of the draft plan, respondents began emphasizing to the Park Service that the parking area and trail would be visible from the proposed BLM trail on the rim above. Subsequently, representatives of the two planning teams discussed the issue and sought solutions.

One option – for the NPS lava trail visitors to share the BLM parking area at the wilderness trailhead in South Big Narrows – was considered. This access would parallel NM 117 for 0.7 mile and also cross NM 117, a safety concern for pedestrians and drivers. To walk from this parking area, walk the NPS lava trail, and return would be approximately 1.8 miles, which could discourage some elderly people, families with small children, or people with disabilities. Another option would be for the Bureau of Land Management to align approximately the first mile of its scenic trail back from the rim so the Narrows parking area would not be visible. Relocation of this part of the trail to the east would also place it partly in a natural drainage that is not as steep as the rim route, making it safer and reducing the cost of construction.

The New Mexico State Highway and Transportation Department is planning to realign the curves on NM 117 on both the north and south ends of the Narrows because of accidents, including fatalities, that have occurred. The department still needs to conclude their redesign and related public involvement process, including the Park Service, Bureau of Land Management, and the Pueblo of Acoma, who all have interest in where the road is realigned. The Park Service and the others will work closely with the highway department to find the best solutions, which may involve improvements in signing and law enforcement as well as road design. Cooperative resolution is important, not only because of the potential for some realignment options to impair resources, but also because some shifts in the road on the south end of the Narrows could either adversely or beneficially affect the opportunity to provide parking for a future Narrows lava trail. Certain realignments, even slight ones, could result in parking space that is closer to the lava trail than the BLM trailhead and where visual impact on visitors using the BLM rim trail would be less. The options would need to take not only safety into account, but also various other objectives, including a firsthand educational viewing experience (handicap accessible if possible) on the McCartys flow, lessening of the impact on views from the BLM rim trail, and protecting the environmental quality of the Narrows as a whole, including areas significant to American Indians. Final planning for the lava trail and parking area will occur when the highway issues are resolved.

McCartys Crater Overlook

Two respondents favored option 2 – not to construct a spur road and trail to McCartys Crater viewpoint – rather than providing this access.

The spur road and viewpoint trail will not be undertaken because the crater can be seen and interpreted from both Sandstone Bluffs overlook and the BLM's wilderness rim trail beginning at South Big Narrows. This also avoids the environmental impact and cost of option 1.

McCartys Crater Bombing Range

One respondent expressed concern about visitors entering the McCartys Crater area, a former World War II bombing range. An addition to the plan text addresses this issue. The Park Service is in communication with the Department of Defense about removing bombs and related debris from the monument. Some objects have already been removed, and there are plans for the systematic search and removal of remaining ordnance. In the interim, safety of the few visitors who desire access to this area will be controlled by permit.

Roadside Kiosk along NM 117

No comments were received on this subject. The Park Service will proceed with the Bureau of Land Management in designing the kiosk on NM 117 to inform visitors approaching El Malpais from the south about the services, activities, and resources ahead. During planning, the Park Service and the Bureau of Land Management studied three other potential sites for information structures – one each at the northern boundaries of the conservation area on NM 117 and NM 53, and one at the western boundary of the conservation area on NM 53. The Park Service considers it a low priority for orienting visitors to the national monument in these last three places because of the existing or proposed visitor/information centers at Grants, El Morro,

Bandera Crater, and 9 miles south of I-40 on NM 117. The Park Service will, however, design all four structures and parking areas, and the Bureau of Land Management will construct and maintain the facilities. The Park Service and the Bureau of Land Management will work with the U.S. Forest Service and the state highway department to develop comprehensive orientation at the rest area on NM 53 west of the monument and conservation area.

Facilities and Utilities Development

Three letters addressed the treatment of facilities, including utilities, in the draft plan. Many comments were in support of the plan; however, one urged addition of language to ensure that the design of the proposed Bandera visitor center is in visual harmony with its environs. Another letter asked that the plan cover solid waste disposal and the visual obtrusions of power lines.

Although details about the design of both visitor centers is contained in appendix E, a statement about the proposed visitor center blending with its environment has been added to the text. Also added are statements about management of solid waste and transmission lines. (The draft plan addressed undergrounding of monument-related power lines.

Coordination with Road Authorities

One letter observed that the monument boundaries include adjacent segments of NM 53 and NM 117; noted that operations, maintenance, and construction by the state could impact monument purposes including visitor use; and pointed out that several issues would have to be resolved through effective coordination between the Park Service and the highway authorities.

Because the state highways within the monument boundaries could be perceived by some visitors as being under NPS management and highway management could affect resources and the visitor experience, the Park Service has and will continue to coordinate with state highway authorities on issues of concern. The need for coordination extends also to county roads and to roads serving access needs of private interests. Some road-related matters that concern the Park Service also concern the Bureau of Land Management, Forest Service, and American Indians, necessitating multiparty coordination. Although the plan has been revised to reflect these concerns, most of the subject road right-of-ways are not owned by the Park Service, and there are limits in resolving all road issues entirely in favor of monument values.

The plan proposes several actions that require ongoing coordination with road authorities and others for successful implementation, e.g., the possible realignment of curves in the Narrows section of NM 117 and related decisions about parking and trail access for the proposed lava trail; relocation of the NM 53/Route 42 intersection for improved sight distance; realignment and improvement of the northern portions of Route 42; signing I-40 to identify the presence of the multiagency center; and future closure of parts of the Corral road in the El Calderon area of the monument. Monument officials have also been active in addressing tree removal within the NM 53 right-of-way and have successfully coordinated with state highway authorities as well as BLM personnel in signing the monument and conservation area boundaries and access points to visitor use areas. Additionally, upon establishment of the national monument, the Park Service opted to have the monument boundaries include the adjacent highway rights-of-way; this was done willingly to incur major responsibility in helping resolve issues that could affect monument purposes.

Continental Divide Trail

Three respondents were concerned that the draft plan had not addressed the Continental Divide National Scenic Trail (CDNST). One letter went on to correctly observe that the general management plan does not need to be the vehicle for decisions about the trail, but that some conclusion should be made as to the capability of the proposed trail system in the monument to incorporate a future CDNST. This letter also suggests that the Zuni-Acoma Trail as a link in the CDNST would accommodate most options for the CDNST that have been discussed to date. The Bureau of Land Management's draft *General Management Plan* identifies their preferred route for the CDNST in El Malpais: following the NM 117 corridor and the Acoma-Zuni Trail, and passing through the Bandera Crater and Chain of Craters areas.

A new section on the CDNST has been added in the NPS final plan. It discusses the potential of the Zuni-Acoma Trail as a future segment of the CDNST and clarifies that the decisions on the future of the CDNST in the monument will be made after interagency preparation of an environmental document (the Forest Service will be the lead agency).

Resource Monitoring and Carrying Capacity

One respondent said the plan's proposals for monitoring visitor impacts should relate more strongly to the environmental protection plans. It was felt that the section on monitoring activities should reflect how the Park Service's monitoring will, with assurance, be carried out routinely and thoroughly by qualified staff. Use of expert volunteers and outside institutions to assist this endeavor was encouraged. The contributions of a well-designed and adequately funded monitoring/ investigation program were felt to be essential in determining the carrying capacity of the monument. The conclusion was that an impact management program be proposed in the *General Management Plan*.

Extensive additions were made to the "Visitor Use Monitoring" (formerly "Carrying Capacity") of this final plan; appendix K was also added – all in the interest of clarifying how the Park Service intends to pursue its basic mandate to preserve the resources and provide for public enjoyment of same so as to perpetuate these qualities for future generations.

Biophysical Land Units

Two respondents noted that the Park Service had not used data from the BLM's geographic information system (GIS) on the maps covering the general management plan, development concept plans, and wilderness suitability study for the monument; respondents felt that this GIS information should have been given more consideration.

The BLM's biophysical land units (BLUs), which cover the monument and the conservation area and were developed from GIS data, are mapped in the BLM's draft plan in cells 100 meters on each side. This scale is too coarse in resolution for effective site planning. Even though some of the data comprising the BLUs can be resolved to 30-meter cells, there is still not enough discrimination within the definitions of the 11 basic BLU categories to be useful for this type of NPS planning. For example, the percent slope in these categories in the general area of the proposed visitor center and access road near Bandera Crater is 3-50 in one of the categories and 10-50 in the other, and the potential for erosion of soils is described as "low to moderate." Soil depth and most engineering and recreational limitations are not described. The Park Service needed much more refined information in its potential development sites, so technical personnel of the planning team visited and walked over these areas, observing firsthand the slopes, vegetative character, and erodibility of soils. Conclusions were drawn as to the suitability of these areas for sustaining use under the various development concepts. Early in the next stage of site planning – comprehensive design – all of the required resource surveys, detailed soil tests, etc., will be performed and used to determine the exact locations of the facilities; mitigations to minimize or avoid adverse impacts to resources will also be prescribed.

As more specific and refined data on monument resources become available, a GIS system for the monument will be developed, using data from the GIS developed by the Bureau of Land Management. This addition has been added to the "The Plan for Natural Resource and Wildlife Management" section.

Cultural Resource Planning

Six letters were supportive of the draft plan for cultural resources management, citing various aspects of accommodating American Indian interests, such as their participation in developing interpretive programs. One of the six letters complimented the comprehensiveness of the document and stated the preferred alternative best serves the intent of the El Malpais and National Historic Preservation acts. However, this letter also called for a clearer description of how the Park Service and the Bureau of Land Management will coordinate in their preparation of resource management, ethnographic, and cultural landscape plans and studies. A new section, "Coordination with the Bureau of Land Management," has been added to the final plan.

Natural Resource Planning

One respondent supported the plan's intent to obtain baseline data and conduct research for many categories of resources. Particular care was urged in managing fire where accumulated levels of fuel would burn hotter and higher, thereby producing unnatural effects. Concern was also expressed about the impact of the proposed primitive campground and roads and trails on turkey habitat, including roosting trees, in the East Rendija area.

Recent BLM assessment of fuel conditions in the national monument show that unnatural levels have built up in very few areas, and overall the accumulations are closer to natural than in most units of the national park system. Fuel buildup will not be a major concern in the future fire management plan, which will be developed in compliance with the new NPS *Fire Management Guidelines* and departmental policy (both have been revised since 1988.)

One of the reasons the campground is proposed where shown on the map of the East Rendija area is that this area is not in the ponderosa pine zone, thus avoiding prime turkey habitat. Still, this issue will be considered in the final design and location of roads, trails, and other facilities in known and potential turkey habitat.

Grazing

Three of the four respondents addressing this use stated they had not seen the *Grazing Management Plan* for the monument. All four essentially stated that despite the legislatively required termination of grazing in the monument on January 1, 1998, and the participation of the Bureau of Land Management in managing grazing until that date, the Park Service should become active in monitoring and managing the effects of grazing and intervene in cases of resource degradation. Three expressed concern about what grazing practices and improvements to roads or other facilities would be allowed prior to 1998.

References to the *Grazing Management Plan* have been made in the text to show that the plan has been completed.

The *Grazing Management Plan* has now been distributed more widely, and special effort has been made to discuss the plan with those concerned. The Park Service retains basic management responsibility for grazing in the monument, even though the Bureau of Land Management and the Forest Service are administering the permits. The Park Service is actively overseeing the grazing program, including permitting, and has recommended reduction in the animal unit months (AUMs) allowed in the monument. These recommendations are currently being carried out by the Bureau of Land Management and the Forest Service. No new range improvements are allowed in the period prior to the phaseout of grazing. Only maintenance of existing improvements to roads and other facilities is being allowed.

Cave Protection

Three respondents addressed cave protection issues. Two stated support for the minimum requirements alternative because it would have less impact on cave resources. One of these two letters expressed doubt that the preferred alternative meets the basic preservation mandate stated in the El Malpais legislation. The letter points out potential impacts on additional types of cave resources, advocates mandatory public education programs and access to caves by permit or guided tours only, and states that cave specialists and the interested public should be involved in developing the comprehensive cave management plan. The third respondent expressed dissatisfaction with the proposed gating of the road to Braided Cave.

All references to gating the entrance to Braided Cave have been deleted from the plan; relatively few visitors are expected to travel this primitive road, and a small primitive parking area and marked walking route at the present standard will continue to suffice unless the situation changes.

Potential impacts to fragile resources in Braided Cave do extend beyond breakage of lavacicles, as earlier stated. Sensitive biotic habitats could be disturbed, and delicate crystals of both common and rare minerals and gray sand and tiger stripe deposits could be damaged by touching, breaking, and graffiti. The cave management plan will address these issues related to preservation of underground resources, as well as monitoring and assessing visitor use impacts and prescribing

mitigations such as public education, guided tours, and permit entry. Interested individuals, members of cave organizations, and cave science professionals will be invited to participate in the cave management planning process in accord with the Federal Cave Resource Protection Act. Also, the preservation of cave resources is a topic likely to be considered under the monument's impact management program.

Wilderness – Grazing

There was one comment on grazing and how it has influenced wilderness suitability. The same comment also requested information on any area not classified as suitable for wilderness because of livestock-related facilities.

The wilderness suitability study does not state that areas have been excluded solely because of grazing or livestock-related facilities. The study states "wilderness includes lands that have been . . . grazed" and "lands will not be excluded from wilderness because . . . lands contain rights or privileges, such as livestock grazing and stock driveways." A sentence has been added to the final study to further clarify this.

Wilderness – Cerro Encierro Road

Two respondents questioned the exclusion of this road from lands identified as suitable for wilderness. Specific concerns included whether the road is a road or a way (i.e., its means of construction and maintenance), its intended use by the Park Service and the public, and why it is identified in the draft study text as a "primitive vehicular recreational opportunity."

The vehicular route to Cerro Encierro is clearly a "road" as defined in the "Wilderness Suitability Study" section. This road was partially constructed by use of a bulldozer and was maintained on an annual basis. The park staff has determined that it is necessary for protection of monument resources, including the activities stated in the text of the draft study. The road will also assist with locating and removing trespass cattle following elimination of grazing. The road will offer an excellent hiking opportunity because vehicular use is expected to be infrequent.

"Primitive vehicular recreational opportunity" has been changed to "backcountry motorized recreational opportunity" to be compatible with terminology in the "Visitor Facilities/Development Plan" section. A reference to this section has been made in the "Wilderness Suitability Study" to provide the reader with a definition of this term. Also added is that the roads to Cerro Encierro and Lost Woman Crater were maintained by mechanical means on an annual basis.

Wilderness – NPS Priorities in Identifying Wilderness-Suitable Areas and Sufficiency of Wilderness-Suitable Acreage

Two respondents addressed these topics at length. One commented that the Park Service apparently determined the Narrows development area as unsuitable for wilderness because of intended development there. The other stated there should be more acres added to the 95,811 acres identified in the draft study.

The Park Service has a two-fold mandate to preserve resources as well as to provide for their enjoyment, including recreation and interpretation.

During general management planning, the Park Service team identified opportunities for introducing the public to resources important to the purposes of the national monument, including lava flow resources. The rationale for selecting the Narrows for a lava flow trail is in the plan and is further detailed in the Narrows section of this public involvement summary. Because parking may still be needed for the proposed trail, this small area has been determined unsuitable for wilderness pending future planning.

Wilderness is not the only means of preserving park resources. Even in areas with roads and numerous visitors, the Park Service is still responsible for preserving resources (see "Carrying Capacity and Impact Management" section). Still, the Park Service has taken its responsibilities and opportunities to use wilderness suitability for preservation seriously. In planning for El Malpais, the Park Service has sought ways to increase the wilderness-suitable acreage.

The El Malpais legislation identified more than 7,000 acres of "potential development areas," which the Park Service was not required to study

for wilderness suitability; yet the draft study did address wilderness suitability in those areas after formulating the road and development alternatives. The result was more than 2,200 additional acres found suitable for wilderness.

In the draft study, 95,811 acres (83 percent of the monument) were found suitable for wilderness. Between the draft and final, portions of the Twin/Lost Woman Crater and south McCarty Crater areas were added. In the final study, 97,428 acres (almost 85 percent of the monument) were found suitable for wilderness.

Wilderness – Areas Outside the Margins of Major Flows

Five letters questioned the criteria used to determine wilderness-suitable boundaries along lava flow margins. One of these letters indicated that some of the wilderness-suitable areas should be extended outward from the edges of lava flows to the nearest roads. Another letter questioned exclusion of suitability of three areas on the western boundary of the southeastern part of the monument and also directed this question to areas that had been excluded on the east side of the monument. Two of the letters inquired why only 83 percent of the monument had been found suitable when the document stated that approximately 95 percent of the monument is covered by rugged lava flows. Two other letters referred to the terminology used in the draft study in regard to "lava fringe areas," and identified the areas influenced by the margins of lava flows as ecologically important zones.

Apparently there was some misunderstanding about the percentage of the monument covered by lava flows and how this affected the determination of wilderness-suitable areas. Page 182 of the draft document describes approximately 95 percent of the monument as covered by rugged lava flows. Some are much more rugged and topographically pronounced than others, so the word rugged has been removed. The statement on page 182 was not meant to suggest that the areas covered by lava would be suitable for wilderness. Also a statement on page 183 needs clarification: "The suitable areas include large portions of the major lava flows – including the McCartys, Laguna, and Bandera flows." This is accurate (although the term Laguna is outmoded and has been renamed Hoya de Cibola by geologists), but is merely a statement of fact rather than a criterion; it has been removed from the sentence. However, this information has been rephrased elsewhere: "In several places the margins of the McCartys, Hoya de Cibola, Bandera, and Twin Craters flows were used to delineate wilderness-suitable areas." In the final wilderness suitability study the confusing term "lava fringe areas" has been deleted or rephrased as "areas outside the flow margins." However, the importance of the lava-edge ecotones has not been ignored, as described later.

The final study identifies all or parts of several areas, including the Bandera Crater, East Rendija, El Calderon, Sandstone Bluffs, Las Ventanas, Zuni-Acoma trailheads, Narrows, and the multiagency center site, as unsuitable for wilderness. These areas were excluded because of existing or proposed roads and other development. In many other parts of the monument, three different situations prevail, and study procedures were recognized for each case:

> Where the monument boundary crosses major flows, the monument boundary should be the wilderness-suitable line.
>
> Where the monument boundary lies outside the margins of flows and the areas outside these margins do not contain roads or development that need to be retained, the monument boundary should be the wilderness-suitable line.
>
> Where the monument boundary lies outside the margins of the flows and the areas outside these margins do contain roads or development that need to be retained, the flow margins should be the wilderness-suitable line.

Study procedures described in the first case seem to have held up. In the second case, where one letter points out the need to identify three areas along the western boundary of the southeastern part of the monument as suitable for wilderness, the draft study did not apply the study procedures; this has been rectified on the map and acreage figures in the final study.

The third case raises some questions about the areas between the margins of the McCartys flow and NM 117. The study procedures described earlier were applied correctly here, but the letters bring out two points. First, in a manner often

followed in wilderness studies for other areas, the wilderness-suitable line could be extended beyond the flow margin to the nearest road needed for future use. Second, the ecotone along the flow margin is habitat for wildlife and does extend beyond the flow. After evaluating these areas, some of the sandstone ridges adjacent to the lava flows in the North Pasture area have been included as wilderness-suitable lands. Other areas between the McCartys flow and NM 117 will be reevaluated before a formal wilderness recommendation is made – when more information is available regarding the size and complexity of ecotones, the specific roads needed for management purposes, and the need for American Indian access to ensure privacy for their special activities. These other areas are considered unsuitable at this time because they do not meet Wilderness Act criteria.

- Some areas consist of ridges and long, uniform slopes facing NM 117 that are only sparsely covered by pinyon and juniper and do not present "outstanding opportunities for solitude" and "opportunities for primitive, unconfined recreation" because the highway is clearly visible and audible.
- Wilderness is a place "where man is a visitor" and that is "untrammeled by man," yet manmade facilities are found in these areas, among them a large sandstone quarry, a large road material storage site and remains of associated temporary storage structures, a smaller road materials site, two wells and associated windmills, corrals, fences, tanks, maintained roads, homestead sites requiring cultural resource evaluations and possible rehabilitation or removal, and miles of off-road-vehicle tracks and ruts.

Intensive management will be required to rehabilitate these areas from the human impacts described above, especially in some lava-edge ecotones. These ecotones can best be managed if management has easier access than wilderness designation provides.

In some areas the lava-edge ecotone is not nearly as pronounced as in other areas or as sensitive due to much less rainfall, human impact, and a much shorter plant succession time frame. Because of the concern for preservation and management of the lava-edge ecotones, wording has been added to the "Plan for Natural Resource and Wildlife Management" section that the Park Service will manage these areas to enhance these ecotones whenever possible.

Under federal policy, before the Park Service can initiate recommendations for wilderness to Congress, a formal wilderness study including an environmental impact statement would be necessary. The areas found suitable in the current study would again be evaluated, and the areas mentioned in the third case, which are beyond the flow margins, would be reexamined for wilderness potential.

PUBLIC MEETING RESPONSES TO DRAFT *GENERAL MANAGEMENT PLAN*

After distribution of the draft plan, two public meetings were held, one on April 18, 1990, in Grants and one on April 19, 1990, in Albuquerque. Discussions at the Grants meeting emphasized the Narrows development and realignment and/or improvement of Route 42. Discussions at the Albuquerque meeting focused on biophysical land units, natural resource planning, cave protection, and the wilderness study. Several people complimented the Park Service on the quality and extensiveness of the draft plan. Many other comments at both meetings were in the form of questions that were answered by the monument superintendent.

Formal and informal comments received at the April public meetings included both support and opposition to realigning the first 2 miles of Route 42 to the west side of Cerro Bandera. One person asked if the *Land Protection Plan* deals with biophysical land units. (It was explained that BLU information will be applied principally in detailed plans for resource management.) There was also a question about NPS policy on fire and a request that the future fire management plan for the monument undergo a minimum of 30 days public review.

Regarding grazing, questions centered on how the effects of grazing are assessed and monitored; who was on the mailing list when the *Grazing Management Plan* was distributed; if the Park Service will have input on grazing levels based on monitoring information; how many and what types of livestock graze in the monument; and if there is only one well used for watering livestock in the monument.

One question at the Albuquerque public meeting was if the public would be involved in formulating cave management policy in the monument. Informal comments showed much concern about the ability of the Park Service to protect fragile cave resources, including those at Braided Cave.

Another question was how the study correlated the monument boundary, wilderness-suitable areas, and proposed road realignments (NM 117). One person asked if the Park Service wilderness study will specify the wilderness boundaries and what the status of the study is relative to wilderness designation for the monument.

Regarding the Narrows development, comments at the public meetings were similar to those expressed in the letters and, in fact, one of the letters was read at the Grants meeting and two of the concerns were emphasized.

> The first concern is the future speed and volume of truck traffic on NM 117 that would be encouraged by improvements under consideration by the state. These improvements include the redesign of curves in the Narrows area and the upgrade of the road in general. The concern is that future traffic will be hazardous to visitors at pullouts and that the number of pullouts should be kept at a minimum and be only at Sandstone Bluffs and La Ventana arch. In answer, there is some doubt that the curves could be realigned to the extent that vehicles could maintain full legal speed and, as stated previously, signing and law enforcement would also enter into mitigation of the hazards. Should the state decide to upgrade the standard of the highway in general and therefore promote use perceived to be at odds with El Malpais mandates, it is also necessary to realize that the Park Service and the Bureau of Land Management do not have basic authority over the highway and, like other interested parties, must assert their concerns the best they can through coordinated planning with the state. From the NPS and BLM standpoints, this coordination certainly includes working out safe lane design and signing side roads and pullouts that serve visitor attractions in the monument and conservation area.
>
> The second concern is that the NPS plan proposed a Narrows lava trail that would impact the view from the BLM rim trail, and at the same time chose not to propose a trail below Sandstone Bluffs because that view would have been similarly impacted (p. 105, draft plan). The Park Service agrees the rationale was inconsistent. However, ongoing planning to possibly relocate the rim rail and reduce the visual impact of the lava trail parking (as explained in the preceding summary section on the Narrows) will help alleviate this impact at the Narrows. Also, there are two additional points that should have been included when the section on page 105 was prepared. First, the surface features of the McCartys flow below Sandstone Bluffs are not of comparable quality to those in the southern part of the Narrows (see preceding summary section for letters received about the Narrows). Second, a trail below the rim is not feasible because the only access point at the south end of Sandstone Bluffs is owned by the Acoma Tribe, and they have opted not to exchange their interests in these lands.

APPENDIXES / BIBLIOGRAPHY / PREPARERS

Public Law 100-225
100th Congress

An Act

To establish the El Malpais National Monument and the El Malpais National Conservation Area in the State of New Mexico, to authorize the Masau Trail, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

TITLE I—EL MALPAIS NATIONAL MONUMENT

ESTABLISHMENT OF MONUMENT

SEC. 101. (a) In order to preserve, for the benefit and enjoyment of present and future generations, that area in western New Mexico containing the nationally significant Grants Lava Flow, the Las Ventanas Chacoan Archeological Site, and other significant natural and cultural resources, there is hereby established the El Malpais National Monument (hereinafter referred to as the "monument"). The monument shall consist of approximately 114,000 acres as generally depicted on the map entitled "El Malpais National Monument and National Conservation Area" numbered NM-ELMA-80,001-B and dated May 1987. The map shall be on file and available for public inspection in the offices of the Director of the National Park Service, Department of the Interior.

(b) As soon as practicable after the enactment of this Act, the Secretary of the Interior (hereinafter referred to as the "Secretary") shall file a legal description of the monument with the Committee on Interior and Insular Affairs of the United States House of Representatives and with the Committee on Energy and Natural Resources of the United States Senate. Such legal description shall have the same force and effect as if included in this Act, except that the Secretary may correct clerical and typographical errors in such legal description and in the map referred to in subsection (a). The legal description shall be on file and available for public inspection in the offices of the National Park Service, Department of the Interior.

TRANSFER

SEC. 102. Lands and waters and interests therein within the boundaries of the monument, which as of the day prior to the date of enactment of this Act were administered by the Forest Service, United States Department of Agriculture, are hereby transferred to the administrative jurisdiction of the Secretary to be managed as part of the monument in accordance with this Act. The boundaries of the Cibola National Forest shall be adjusted accordingly.

MANAGEMENT

SEC. 103. The Secretary, acting through the Director of the National Park Service, shall manage the monument in accordance with

the provisions of this Act, the Act of August 25, 1916 (39 Stat. 535; 16 U.S.C. 1 et seq.), and other provisions of law applicable to units of the National Park System. The Secretary shall protect, manage, and administer the monument for the purposes of preserving the scenery and the natural, historic, and cultural resources of the monument and providing for the public understanding and enjoyment of the same in such a manner as to perpetuate these qualities for future generations.

PERMITS

SEC. 104. Where any lands included within the boundary of the monument on the map referred to in subsection 101(a) are legally occupied or utilized on the date of enactment of this Act for grazing purposes, pursuant to a lease, permit, or license which is—

(a) for a fixed term of years issued or authorized by any department, establishment, or agency of the United States, and

(b) scheduled for termination before December 31, 1997,

the Secretary, notwithstanding any other provision of law, shall allow the persons holding such grazing privileges (or their heirs) to retain such grazing privileges until December 31, 1997, subject to such limitations, conditions, or regulations as the Secretary may prescribe to insure proper range management. No grazing shall be permitted on lands within the boundaries of the monument on or after January 1, 1998.

TITLE II—MASAU TRAIL

DESIGNATION OF TRAIL

SEC. 201. In order to provide for public appreciation, education, understanding, and enjoyment of certain nationally significant sites of antiquity in New Mexico and eastern Arizona which are accessible by public road, the Secretary, acting through the Director of the National Park Service, with the concurrence of the agency having jurisdiction over such roads, is authorized to designate, by publication of a description thereof in the Federal Register, a vehicular tour route along existing public roads linking prehistoric and historic cultural sites in New Mexico and eastern Arizona. Such a route shall be known as the Masau Trail (hereinafter referred to as the "trail").

AREAS INCLUDED

SEC. 202. The trail shall include public roads linking El Malpais National Monument as established pursuant to title I of this Act, El Morro National Monument, Chaco Cultural National Historical Park, Aztec Ruins National Monument, Canyon De Chelly National Monument, Pecos National Monument, and Gila Cliff Dwellings National Monument. The Secretary may, in the manner set forth in section 201, designate additional segments of the trail from time to time as appropriate to link the foregoing sites with other cultural sites or sites of national significance when such sites are designated and protected by Federal, State, or local governments, Indian tribes, or nonprofit entities.

INFORMATION AND INTERPRETATION

SEC. 203. With respect to sites linked by segments of the trail which are administered by other Federal, State, local, tribal, or nonprofit entities, the Secretary may, pursuant to cooperative agreements with such entities, provide technical assistance in the development of interpretive devices and materials in order to contribute to public appreciation of the natural and cultural resources of the sites along the trail. The Secretary, in cooperation with State and local governments, Indian tribes, and nonprofit entities, shall prepare and distribute informational material for the public appreciation of sites along the trail.

MARKERS

SEC. 204. The trail shall be marked with appropriate markers to guide the public. With the concurrence and assistance of the State or local entity having jurisdiction over the roads designated as part of the trail, the Secretary may erect thereon and maintain signs and other informational devices displaying the Masau Trail Marker. The Secretary is authorized to accept the donation of suitable signs and other informational devices for placement at appropriate locations.

TITLE III—EL MALPAIS NATIONAL CONSERVATION AREA

ESTABLISHMENT OF AREA

SEC. 301. (a) In order to protect for the benefit and enjoyment of future generations that area in western New Mexico containing the La Ventana Natural Arch and the other unique and nationally important geological, archeological, ecological, cultural, scenic, scientific, and wilderness resources of the public lands surrounding the Grants Lava Flows, there is hereby established the El Malpais National Conservation Area (hereinafter referred to as the "conservation area"). The conservation area shall consist of approximately 262,690 acres of federally owned land as generally depicted on a map entitled "El Malpais National Monument and National Conservation Area" numbered NM-ELMA-80,001-B and dated May 1987. The map shall be on file and available for inspection in the offices of the Director of the Bureau of Land Management of the Department of the Interior.

(b) As soon as practicable after the date of enactment of this Act, the Secretary shall file a legal description of the conservation area designated under this section with the Committee on Energy and Natural Resources of the United States Senate and the Committee on Interior and Insular Affairs of the United States House of Representatives. Such legal description shall have the same force and effect as if included in this Act, except that the Secretary may correct clerical and typographical errors in such legal description. The legal description shall be on file and available for public inspection in the offices of the Director of the Bureau of Land Management, Department of the Interior.

MANAGEMENT

SEC. 302. (a) The Secretary, acting through the Director of the Bureau of Land Management, shall manage the conservation area to protect the resources specified in section 301 and in accordance with this Act, the Federal Land Management and Policy Act of 1976

and other applicable provisions of law, including those provisions relating to grazing on public lands.

(b) The Secretary shall permit hunting and trapping within the conservation area in accordance with applicable laws and regulations of the United States and the State of New Mexico; except that the Secretary, after consultation with the New Mexico Department of Game and Fish, may issue regulations designating zones where and establishing periods when no hunting or trapping shall be permitted for reasons of public safety, administration, or public use and enjoyment.

(c) Collection of green or dead wood for sale or other commercial purposes shall not be permitted in the conservation area.

(d) Except as otherwise provided in section 402(b), within the conservation area the grazing of livestock shall be permitted to continue, pursuant to applicable Federal law, including this Act, and subject to such reasonable regulations, policies, and practices as the Secretary deems necessary.

TITLE IV—WILDERNESS

DESIGNATION OF WILDERNESS

SEC. 401. (a) In furtherance of the purposes of the Wilderness Act (78 Stat. 890; 16 U.S.C. 131), there are hereby designated as wilderness, and, therefore, as components of the National Wilderness Preservation System, the Cebolla Wilderness of approximately 60,000 acres, and the West Malpais Wilderness of approximately 38,210 acres, as each is generally depicted on the map entitled "El Malpais National Monument and National Conservation Area" numbered NM-ELMA-80,001-B and dated May 1987. The map shall be on file and available for inspection in the offices of the Director of the Bureau of Land Management, Department of the Interior.

(b) As soon as practicable after the date of the enactment of this Act, the Secretary shall file a legal description of each wilderness area designated by this Act with the Committee on Interior and Insular Affairs of the United States House of Representatives and with the Committee on Energy and Natural Resources of the United States Senate. Such legal description shall have the same force and effect as if included in this Act, except that the Secretary may correct clerical and typographical errors in such legal description. The legal description shall be on file and available for public inspection in the offices of the Director of the Bureau of Land Management, Department of the Interior.

MANAGEMENT

SEC. 402. (a) Subject to valid existing rights, each wilderness area designated under this Act shall be administered by the Secretary, through the Director of the Bureau of Land Management, in accordance with the provisions of the Wilderness Act governing areas designated by that Act as wilderness, except that any reference in such provisions to the effective date of the Wilderness Act shall be deemed to be a reference to the date of enactment of this Act.

(b) Within the wilderness areas designated by this Act, the grazing of livestock, where established prior to the enactment of this Act, shall be permitted to continue subject to such reasonable regulations, policies, and practices as the Secretary deems necessary, as

long as such regulations, policies, and practices fully conform with and implement the intent of Congress regarding grazing in such areas as such intent is expressed in the Wilderness Act and section 108 of Public Law 96-560 (16 U.S.C. 1133 note).

TITLE V—GENERAL PROVISIONS

MANAGEMENT PLANS

SEC. 501. (a) Within three full fiscal years following the fiscal year of enactment of this Act, the Secretary shall develop and transmit to the Committee on Interior and Insular Affairs of the United States House of Representatives and the Committee on Energy and Natural Resources of the United States Senate, separate general management plans for the monument and the conservation area which shall describe the appropriate uses and development of the monument and the conservation area consistent with the purposes of this Act. The plans shall include but not be limited to each of the following:

(1) implementation plans for a continuing program of interpretation and public education about the resources and values of the monument and the conservation area;

(2) proposals for public facilities to be developed for the conservation area or the monument, including a visitors center in the vicinity of Bandera Crater and a multiagency orientation center, to be located in or near Grants, New Mexico, and adjacent to Interstate 40, to accommodate visitors to western New Mexico;

(3) natural and cultural resources management plans for the monument and the conservation area, with a particular emphasis on the preservation and long-term scientific use of archeological resources, giving high priority to the enforcement of the provisions of the Archeological Resources Protection Act of 1979 and the National Historic Preservation Act within the monument and the conservation area. The natural and cultural resources management plans shall be prepared in close consultation with the Advisory Council on Historic Preservation, the New Mexico State Historic Preservation Office, and the local Indian people and their traditional cultural and religious authorities; and such plans shall provide for long-term scientific use of archaeological resources in the monument and the conservation area, including the wilderness areas designated by this Act; and

(4) wildlife resources management plans for the monument and the conservation area prepared in close consultation with appropriate departments of the State of New Mexico and using previous studies of the area.

(b)(1) The general management plan for the conservation area shall review and recommend the suitability or nonsuitability for preservation as wilderness of those lands comprising approximately 17,468 acres, identified as "Wilderness Study Area" (hereafter in this title referred to as the "WSA") on the map referenced in section 101.

(2) Pending submission of a recommendation and until otherwise directed by an Act of Congress, the Secretary, acting through the Director of the Bureau of Land Management, shall manage the

lands within the WSA so as to maintain their potential for inclusion within the National Wilderness Preservation System.

(c)(1) The general management plan for the monument shall review and recommend the suitability or nonsuitability for preservation as wilderness of all roadless lands within the boundaries of the monument as established by this Act except those lands within the areas identified as "potential development areas" on the map referenced in section 101.

(2) Pending the submission of a recommendation and until otherwise directed by Act of Congress, the Secretary, through the Director of the National Park Service, shall manage all roadless lands within the boundaries of the monument so as to maintain their potential for inclusion in the National Wilderness Preservation System, except those lands within the areas identified as "potential development areas" on the map referenced in section 101.

ACQUISITIONS

SEC. 502. Within the monument and the conservation area, the Secretary is authorized to acquire lands and interests in lands by donation, purchase with donated or appropriated funds, exchange, or transfer from any other Federal agency, except that such lands or interests therein owned by the State of New Mexico or a political subdivision thereof may be acquired only by exchange. It is the sense of Congress that the Secretary is to complete the acquisition of non-Federal subsurface interests underlying the monument and the conservation area no later than three full fiscal years after the fiscal year of enactment of this Act.

STATE EXCHANGES

SEC. 503. (a) Upon the request of the State of New Mexico (hereinafter referred to as the "State") and pursuant to the provisions of this section, the Secretary shall exchange public lands or interests in lands elsewhere in the State of New Mexico, of approximately equal value and selected by the State, acting through its Commissioner of Public Lands, for any lands or interests therein owned by the State (hereinafter referred to as "State lands") located within the boundaries of the monument or the conservation area which the State wishes to exchange with the United States.

(b) Within six months after the date of enactment of this Act, the Secretary shall notify the New Mexico Commissioner of Public Lands what State lands are within the monument or the conservation area. The notice shall contain a listing of all public lands or interest therein within the boundaries of the State of New Mexico which have not been withdrawn from entry and which the Secretary, pursuant to the provisions of sections 202 and 206 of the Federal Land Policy and Management Act of 1976, has identified as appropriate for transfer to the State in exchange for State lands. Such listing shall be updated at least annually. If the New Mexico Commissioner of Public Lands gives notice to the Secretary of the State's desire to obtain public lands so listed, the Secretary shall notify the Commissioner in writing as to whether the Department of the Interior considers the State lands within the monument or conservation area to be of approximately equal value to the listed lands or interests in lands the Commissioner has indicated the State desires to obtain. It is the sense of the Congress that the exchange of

lands and interests therein with the State pursuant to this section should be completed within two years after the date of enactment of this Act.

MINERAL EXCHANGES

SEC. 504. (a) The Secretary is authorized and directed to exchange the Federal mineral interests in the lands described in subsection (b) for the private mineral interests in the lands described in subsection (c), if—

(1) the owner of such private mineral interests has made available to the Secretary all information requested by the Secretary as to the respective values of the private and Federal mineral interests to be exchanged; and

(2) on the basis of information obtained pursuant to paragraph (1) and any other information available, the Secretary has determined that the mineral interests to be exchanged are of approximately equal value; and

(3) the Secretary has determined—

(A) that except insofar as otherwise provided in this section, the exchange is not inconsistent with the Federal Land Policy and Management Act of 1976; and

(B) that the exchange is in the public interest.

(b) The Federal mineral interests to be exchanged under this section underlie the lands, comprising approximately 15,008 acres, depicted as "Proposec for transfer to Santa Fe Pacific" on the map referenced in subsection (d).

(c) The private mineral interests to be exchanged pursuant to this section underlie the lands, comprising approximately 15,141 acres, depicted as "Proposed for transfer to U.S." on the map referenced in subsection (d).

(d)(1) The mineral interests identified in this section underlie those lands depicted as "Proposed for transfer to Santa Fe Pacific" and as "Proposed for transfer to U.S." on a map entitled "El Malpais Leg. Boundary, HR3684/S56", revised 5-8-87.

(2) As soon as practicable after the date of enactment of this Act, the Secretary shall file a legal description of the mineral interest areas designated under this section with the Committee on Interior and Insular Affairs of the United States House of Representatives and the Committee on Energy and Natural Resources of the United States Senate. Such legal description shall have the same force and effect as if included in this Act, except that the Secretary may correct clerical and typographical errors in such legal description. The legal description shall be on file and available for public inspection in the offices of the Director of the Bureau of Land Management, Department of the Interior.

(e) It is the sense of the Congress that all exchanges pursuant to this section shall be completed no later than three years after the date of enactment of this Act.

ACOMA PUEBLO EXCHANGES

SEC. 505. (a)(1) Upon the request of the Pueblo of Acoma, the Secretary shall acquire by exchange any lands held in trust for the Pueblo of Acoma (hereinafter referred to as "trust lands") located within the boundary of the conservation area which the Pueblo

wishes to exchange pursuant to this section. Such trust lands shall be exchanged either for—

(A) lands described in subsection (c) (with respect to trust lands west of New Mexico Highway 117); or

(B) public lands of approximately equal value located outside the monument and outside the conservation area but within the boundaries of the State of New Mexico which are selected by the Pueblo of Acoma, so long as such exchange is consistent with applicable law and Bureau of Land Management resource management plans developed pursuant to the Federal Land Policy and Management Act of 1976.

(2) All lands selected by and transferred to the Pueblo of Acoma at its request pursuant to this section shall thereafter be held in trust by the Secretary for the Pueblo of Acoma in the same manner as the lands for which they were exchanged.

(3) Any lands west of New Mexico Highway 117 which are acquired by the Secretary pursuant to this section shall be incorporated into the monument and managed accordingly, and section 104 and all other provisions of this Act and other law applicable to lands designated by this Act as part of the monument shall apply to such incorporated lands.

(b) For purposes of acquiring lands pursuant to subsection (a) of this section, the Secretary, consistent with applicable law and Bureau of Land Management resource management plans described in subsection (a), shall make public lands within the boundaries of the State of New Mexico available for exchange. Nothing in this Act shall be construed as authorizing or requiring revocation of any existing withdrawal or classification of public land except in a manner consistent with applicable law.

(c)(1) The Secretary shall make the lands within the areas identified as "Acoma Potential Exchange Areas" on the map referenced in section 301 available for transfer to the Pueblo of Acoma pursuant to this subsection.

(2) Upon a request of the Pueblo of Acoma submitted to the Secretary no later than one year after the date of enactment of this Act, lands within the areas described in paragraph (1) shall be transferred to the Pueblo of Acoma in exchange for trust lands of approximately equal value within that portion of the conservation area west of New Mexico Highway 117. The Secretary may require exchanges of land under this subsection to be on the basis of compact and contiguous parcels.

(3) Any lands within the areas described in paragraph (1) not proposed for exchange by a request submitted to the Secretary by the Pueblo of Acoma within the period specified in paragraph (2), and any lands in such areas not ultimately transferred pursuant to this subsection, shall be incorporated within the conservation area and managed accordingly. In addition, any lands in that portion of the areas described in paragraph (1) lying in section 1, township 7N, range 9W, New Mexico Principal Meridian, not transferred to the Pueblo of Acoma pursuant to this subsection shall be added to and incorporated within the Cebolla Wilderness and managed accordingly.

EXCHANGES AND ACQUISITIONS GENERALLY; WITHDRAWAL

SEC. 506. (a) All exchanges pursuant to this Act shall be made in a manner consistent with applicable provisions of law, including this

Act, and unless otherwise specified in this Act shall be on the basis of equal value; either party to an exchange may pay or accept cash in order to equalize the value of the property exchange, except that if the parties agree to an exchange and the Secretary determines it is in the public interest, such exchange may be made for other than equal value.

(b) For purposes of this Act, the term "public lands" shall have the same meaning as such term has when used in the Federal Land Policy and Management Act of 1976.

(c) Except as otherwise provided in section 505, any lands or interests therein within the boundaries of the monument or conservation area which after the date of enactment of this Act may be acquired by the United States shall be incorporated into the monument or conservation area, as the case may be, and managed accordingly, and all provisions of this Act and other laws applicable to the monument or the conservation area, as the case may be, shall apply to such incorporated lands.

(d)(1) Except as otherwise provided in this Act, no federally-owned lands located within the boundaries of the monument or the conservation area shall be transferred out of Federal ownership, or be placed in trust for any Indian tribe or group, by exchange or otherwise.

(2) Except as otherwise provided in this Act, and subject to valid existing rights, all Federal lands within the monument and the conservation area and all lands and interests therein which are hereafter acquired by the United States are hereby withdrawn from all forms of entry, appropriation, or disposal under the public land laws and from location, entry and patent under the mining laws, and from operation of the mineral leasing and geothermal leasing laws and all amendments thereto.

(e) The acreages cited in this Act are approximate, and in the event of discrepancies between cited acreages and the lands depicted on referenced maps, the maps shall control.

(f) The Secretary is authorized to accept any lands contiguous to the boundaries of the Pecos National Monument (as such boundaries were established on the date of enactment of this Act) which may be proposed for donation to the United States. If acceptance of such lands proposed for donation would be in furtherance of the purposes for which the Pecos National Monument was established, the Secretary shall accept such lands, and upon such acceptance such lands shall be incorporated into such monument and managed accordingly.

(g)(1) Capulin Mountain National Monument is hereby redesignated as Capulin Volcano National Monument.

(2) Any reference in any record, map, or other document of the United States of America to Capulin Mountain National Monument shall hereafter be deemed to be a reference to Capulin Volcano National Monument.

(3) Section 1 of the Act of September 5, 1962 (76 Stat. 436) is hereby amended by striking the remaining portion of section 1 after "boundaries of the monument" and inserting "shall include the lands and interests in lands as generally depicted on the map entitled 'Capulin Volcano National Monument Boundary Map' which is numbered 125-80,014 and dated January 1987.".

(4) Jurisdiction over federally-owned lands within the revised boundaries of the monument is hereby transferred to the National

Park Service, without monetary consideration, for administration as part of the monument.

ACCESS

SEC. 507. (a) In recognition of the past use of portions of the monument and the conservation area by Indian people for traditional cultural and religious purposes, the Secretary shall assure nonexclusive access to the monument and the conservation area by Indian people for traditional cultural and religious purposes, including the harvesting of pine nuts. Such access shall be consistent with the purpose and intent of the American Indian Religious Freedom Act of August 11, 1978 (42 U.S.C. 1996), and (with respect to areas designated as wilderness) the Wilderness Act (78 Stat. 890; 16 U.S.C. 131).

(b) In preparing the plans for the monument and the conservation area pursuant to section 501, the Secretary shall request that the Governor of the Pueblo of Acoma and the chief executive officers of other appropriate Indian tribes make recommendations on methods of—

(1) assuring access pursuant to subsection (a) of this section;

(2) enhancing the privacy of traditional cultural and religious activities in the monument and the conservation area; and

(3) protecting traditional cultural and religious sites in the monument and the conservation area.

(c) In order to implement this section and in furtherance of the American Indian Religious Freedom Act, the Secretary, upon the request of an appropriate Indian tribe, may from time to time temporarily close to general public use one or more specific portions of the monument or the conservation area in order to protect the privacy of religious activities in such areas by Indian people. Any such closure shall be made so as to affect the smallest practicable area for the minimum period necessary for such purposes. Not later than seven days after the initiation of any such closure, the Secretary shall provide written notification of such action to the Energy and Natural Resources Committee of the United States Senate and the Interior and Insular Affairs Committee of the House of Representatives.

(d) The Secretary is authorized to establish an advisory committee to advise the Secretary concerning the implementation of this section. Any such advisory committee shall include representatives of the Pueblo of Acoma, the Pueblo of Zuni, other appropriate Indian tribes and other persons or groups interested in the implementation of this section.

COOPERATION

SEC. 508. In order to encourage unified and cost effective interpretation of prehistoric and historic civilizations in western New Mexico, the Secretary is authorized and encouraged to enter into cooperative agreements with other Federal, State and local public departments and agencies, Indian tribes, and nonprofit entities providing for the interpretation of prehistoric and historic civilizations in New Mexico and eastern Arizona. The Secretary may, pursuant to such agreements, cooperate in the development and operation of a multiagency orientation center and programs on lands and interests in lands inside and outside of the boundaries of the monument and the conservation area generally, with the concurrence of the owner or administrator thereof, and specifically

in or near Grants, New Mexico, adjacent to Interstate 40 in accordance with the plan required pursuant to section 501.

WATER RIGHTS

SEC. 509. (a) Congress expressly reserves to the United States the minimum amount of water required to carry out the purposes for which the national monument, the conservation area, and the wilderness areas are designated under this Act. The priority date of such reserved rights shall be the date of enactment of this Act.

(b) Nothing in this section shall affect any existing valid or vested water right, or applications for water rights which are pending as of the date of enactment of this Act and which are subsequently granted: *Provided*, That nothing in this subsection shall be construed to require the National Park Service to allow the drilling of ground water wells within the boundaries of the national monument.

(c) Nothing in this section shall be construed as establishing a precedent with regard to any future designations, nor shall it affect the interpretation of any other Act or any designation made pursuant thereto.

AUTHORIZATION

SEC. 510 There is authorized to be appropriated $16,500,000 for the purposes of this Act, of which $10,000,000 shall be available for land acquisition in the national monument; $1 million shall be available for development within the national monument; $4 million shall be available for land acquisition within the conservation area; $1 million shall be available for development within the conservation area; and $500,000 shall be available for planning and development of the Masau Trail.

Approved December 31, 1987.

LEGISLATIVE HISTORY—H.R. 403:

HOUSE REPORTS: No. 100-116 (Comm. on Interior and Insular Affairs).
SENATE REPORTS: No. 100-100 (Comm. on Energy and Natural Resources).
CONGRESSIONAL RECORD, Vol. 133 (1987):
June 1, considered and passed House.
Dec. 17, considered and passed Senate, amended.
Dec. 18, House concurred in Senate amendment.

APPENDIX B: REQUIREMENTS, ISSUES, AND CONCERNS

REQUIREMENTS, ISSUES, AND CONCERNS

Meeting Legislative Requirements

Public Law 100-225 establishing El Malpais National Monument and El Malpais National Conservation Area (see appendix A) directs the National Park Service (NPS) and the Bureau of Land Management (BLM) to complete general management plans for the two areas by September 30, 1991. The legislation identifies several other conditions that must be satisfied in the general management plans. They are as follows:

> The purpose of the monument and conservation area is "to preserve, for the benefit and enjoyment of present and future generations, the area in western New Mexico containing the nationally significant Grants Lava Flow, the Las Ventanas Chacoan Archeological Site, and other significant natural and cultural resources." The secretary of the interior, through the director of the National Park Service, shall manage the monument in accord with the provisions of the El Malpais Act, the act of August 25, 1916 (which established the Park Service), and other laws applicable to units of the national park system. Consistent with the 1916 act, the secretary shall administer the monument for the purposes of preserving the scenery and the natural and cultural resources of the monument and providing for public understanding and enjoyment of the same in such a manner as to perpetuate these qualities for future generations.
>
> Grazing privileges within the monument that are of a fixed term or scheduled for termination before December 31, 1997, are to be continued only temporarily, subject to proper range management; grazing privileges will be discontinued completely on federal lands within the monument on January 1, 1998.

The El Malpais Act authorizes designation of the Masau Trail, a vehicular tour route on existing public roads that links cultural sites in New Mexico and eastern Arizona. El Malpais National Monument is one of seven units linked by the trail, and the secretary of the interior (through the Park Service) is authorized to add other sites of national cultural importance that are protected by federal, state, and local governments, Indian tribes, or nonprofit entities. Informational material is to be distributed along the trail, and the trail will be marked with appropriate markers to guide the public.

The act also authorizes acquisition of land and other interests by donation, purchase, exchange, or transfer. Specific conditions relating to lands of the state of New Mexico, federal mineral interests, and the Pueblo of Acoma are detailed in the legislation (see appendix A).[1] Under the legislation and subject to valid existing rights, location, entry and patent under the mining laws, and granting of mineral and geothermal leases are prohibited.

Access to the monument and conservation area is ensured to Indian people for traditional cultural and religious purposes, including the harvesting of pine nuts, and such access is to be consistent with the American Indian Religious Freedom Act and the Wilderness Act. Planning will proceed in consultation with the Acoma and other Indian tribes to provide this access and protect traditional sites and values; the secretary may, on request, close areas temporarily to protect religious privacy.

Rights to the minimum amount of water necessary to carry out the purposes of the area are reserved to the federal government. Establishment of the monument does not affect preexisting water rights or applications pending (as of the date of the act) that are subsequently granted; the priority date of such

1. Acquisition of nonfederal property and interests in the monument will be based on recommendations in the *Land Protection Plan* (NPS 1990b).

rights is the date of enactment of the El Malpais Act. The Park Service is not required to allow future drilling of water wells within the boundaries of the monument.

Cooperation with other federal, state, and local public departments and agencies, Indian tribes, and nonprofit entities providing for the interpretation of prehistoric and historic civilizations in New Mexico and eastern Arizona is encouraged in order to provide unified and cost-effective interpretation. The secretary is also authorized to cooperate in the development and operation of a multiagency orientation center and programs on lands and interests in lands inside and outside of the boundaries of the monument and conservation area, with concurrence of the owner or administrator.

Funds are authorized for the national monument: $1 million for development, $10 million for land acquisition, and $500,000 for planning and development of the Masau Trail.

In addition, the legislation sets forth requirements for the general management plans for both the monument and the conservation area. These plans will contain at least

visitor services plans, including "a continuing program of interpretation and public education about the resources and values of the monument"

proposals for public facilities, including a visitor center in the vicinity of Bandera Crater and a multiagency orientation center in or near Grants, New Mexico, and adjacent to Interstate 40 to accommodate visitors to western New Mexico

natural and cultural resources management plans, "with a particular emphasis on the preservation and long-term scientific use of archeological resources. . . to be prepared in close consultation with the Advisory Council on Historic Preservation, the New Mexico State Historic Preservation Office, and the local Indian people and their traditional cultural and religious authorities"

wildlife resources management plans, prepared "in close consultation with appropriate departments of the State of New Mexico and using previous studies of the area"

a review and recommendation as to suitability or nonsuitability for wilderness of all roadless lands within the boundaries of the monument, except the lands that are designated for development

Natural Resource Issues

Natural resource studies have been conducted over the years by various agencies and individuals; however, many are dated. A full evaluation of monument resources has not yet been conducted, and additional information/studies are needed on

- threatened and endangered species
- lava tube systems and their fragile biota and rock and mineral formations
- ice deposits and the impacts of human use on these sensitive resources
- the impacts of grazing – including competition between livestock and wildlife for food and water, introduction of exotic vegetation, and degradation of soil, water quality, and aesthetics
- increasing backcountry use
- the incidence of wildfires, fuel-load buildups, and historical fire data
- threats to air quality (baseline data)

In addition, what impacts on soils, vegetation, wildlife, air quality, and visual quality will occur from construction and visitor use in and near developed areas? How will increasing visitation impact resources in backcountry areas, including areas identified as suitable for wilderness? What actions could be taken to mitigate these impacts?

There are scarred areas within the monument (related to past and present mining, timbering, and grazing operations). The main problems related to these practices are soil erosion, proliferation of exotic plant species, disturbance of wildlife habitat, and visual intrusions. Which of the disturbed areas

need to be revegetated and how should reclamation be accomplished?

Cultural Resource Issues

Without accurate information about the location, condition, and significance of cultural resources, visitor use or inappropriate siting of developments could damage the resources, resulting in the loss of scientific information and diminishing opportunities for interpretation. Also, without this information managers cannot make fully informed decisions and they cannot effectively monitor and preserve these resources. What programs need to be started and what are their priorities? What historic structures reports and other specialized plans are needed to guide research, adaptive use, and preservation maintenance actions? What sites are significant and should be nominated to the National Register of Historic Places?

What objects/specimens should be in the El Malpais museum collection? How and where will the collection be stored, managed, and protected? (There are currently no collection plans or curatorial storage facilities at the monument.)

What can be done to stop the looting and vandalism that seriously threaten the archeological resources? What staffing, educational programs, and other types of protection are necessary?

American Indian Concerns

As specified in the enabling legislation, how will the mandated American Indian access to El Malpais for traditional uses, including religious and subsistence activities, be provided? How can visitor trespass on Indian lands be prevented, and how can sacred sites be protected from curiosity seekers, looters, and vandals?

American Indians have expressed concerns that no religious objects be acquired or exhibited by the Park Service and that interpretive programs and media are respectful of American Indian cultures. In what ways can the National Park Service respond to these concerns and how can the Park Service provide interpretive media and information that is acceptable to the American Indians?

How can trust and improved communication between American Indians and federal agencies be promoted? What kind of programs would be acceptable, and what kind of consultation with American Indians would allay their concerns and ensure their input in proper management of monument resources?

Visitor Use Issues

On-Site Interpretation. Some visitor assistance is available at the information center in Grants; however, except for a private tourist operation in the Bandera Crater area, on-site interpretation in the monument is almost totally absent. What access and facilities are needed so that visitors can enjoy a variety of natural and cultural resources? What messages and media (brochures, wayside exhibits, etc.) should the Park Service provide? Are there areas that may be environmentally unsafe for visitors who are not properly prepared, and if so what kind of warnings are appropriate?

Cooperation. The monument and conservation area are contiguous, and the lands of each are administered by two agencies; these lands are also important to various American Indian groups and are contiguous to their lands. What planning needs to take place between the two agencies to avoid duplication and inconsistencies in interpretive services and the selection of features to be interpreted? An interpretive program without consultation with American Indian groups would bypass one of the most important resources of the monument. How can the views of the Indians be incorporated into the interpretive program?

Multiagency Center/Bandera Visitor Center. The El Malpais legislation calls for proposals for a multiagency center near Grants and a visitor center near Bandera Crater. What should be the specific functions, themes, and media concepts for each facility and how can duplication of information and efforts be avoided? How will information about the Masau Trail be presented at the multiagency center?

Recreation. What kind of recreational activities are compatible with protection of the resources and should be provided in the national monument?

Access and Development Issues

Roads. Except for state highways 53 and 117 (hereafter referred to as NM 117 and NM 53), existing roads in the monument are inadequate to accommodate projected visitation and provide for public safety. Road maintenance, even on existing gravel segments, is expensive. County Route 42, like many of the little-used dirt roads, has irregular curves. Water collects on its sunken surface, leading drivers to circumnavigate impassable mud holes, resulting in environmental damage. Most road alignments within the monument do not consider aesthetics, including views of the landscape. The gravel road to Sandstone Bluffs overlook is the only significant visitor access on the east side of the monument. This road is dusty much of the year, becomes muddy after rain, and includes an unsafe curve.

To provide a safe and enjoyable visitor experience and adequately protect the monument resources, what roads need improvement or realignment? Is additional access to some parts of the monument needed? What should be done to provide all-season access to areas that are determined important for this kind of visitor use? Do any roads need to be closed?

Facilities. The temporary El Malpais information center in downtown Grants is the only public facility in the region for NPS and BLM information functions. Because of its small size and location, this facility cannot meet the visitor use needs of the monument once visitation begins to increase. The eastern side of the monument has no facilities for public use other than parking at Sandstone Bluffs overlook. The only developed facilities for day use on the western side of the monument are the privately owned trading post and trails at Bandera Crater, and these structures do not meet federal accessibility standards. What type and size of facilities would accommodate projected visitation and interpretation, staff, and administrative functions?

Utilities. Utilities exist only at Bandera Crater, and these are inadequate to serve projected visitation. What electrical power and telephone services are needed for visitors and staff, and how can the lines be kept visually unobtrusive? What water and sewage treatment facilities are needed in the monument? How will adequate water be supplied?

Trails. There are few trails in the monument; trails in the Bandera Crater area do not lead to enough representative resources for monument purposes and do not provide for various levels of skill. What types of trails in what locations would provide appropriate visitor experiences? What improvements do existing trails need? How could the trail system developed for the monument incorporate the future Continental Divide Trail? The cost of developing new high-standard trails over lava compared to the likely volume of use is also an issue.

Signs. Signs for orientation and information within the monument are virtually nonexistent. The few existing government signs merely mark the monument and conservation area boundaries on NM 53 and NM 117; most of the monument is also lacking signs that identify access and important regulations. What signs are needed and where? What sign design would be easily comprehended and compatible with the resources and landscape? What coordination can be done between the Park Service and the Bureau of Land Management to ensure harmonious and nonduplicative signs?

Handicap Access. Currently there are no special facilities or trail improvements anywhere in the monument to accommodate visitors with mobility, mental, or sensory handicaps. Except for the little that can be seen from inside an automobile, there are no opportunities for handicapped visitors to have firsthand observations of lava caves, lava surface features, or cultural resources. What can be done to make representative areas of the monument available to handicapped individuals?

Management and Operations Issues

The current level of staffing does not adequately provide for management of the monument and its resources in a way that protects the environment and complies with legislative requirements. What programs and staffing levels are needed to provide basic visitor services, maintenance activities, and protection, monitoring, and research of the monument's natural and cultural resources?

There is a total absence of offices, maintenance space, and housing for personnel within the monument boundary. Where should offices and housing be located so that personnel can provide effective management of visitor services and

resources, respond to emergency situations, and dissuade illegal behavior such as looting, vandalism, and trespass? Where should fire suppression equipment, first-aid supplies, and other materials required for emergencies be stored?

Should the administrative headquarters continue to be in a central location, with nearby commercial and housing opportunities? Is the current administrative space large enough to accommodate increases in the monument staff as visitation grows?

Socioeconomic Issues

New jobs and an increase in tourism because of development at El Malpais would help improve the local economy. How can the national monument best contribute to the local economy without compromising the values for which the monument was established?

Issues of Coordination with Other Agencies

What agencies and other entities should join in planning the multiagency center, and what geographic areas and informational services should be within the scope of the facility?

Along NM 117 there are several features of great importance to El Malpais' natural landscape and the archeological and ethnographic resources (some on BLM-managed land and some on NPS-managed land). The Park Service and the Bureau of Land Management have a mutual interest in developing facilities and programs that offer long-term, integral protection of the resources along NM 117 and in meeting the needs of visitors along the NM 117 corridor. What type of facilities will be required to effectively manage the corridor, where should they be built, and what staffing from both agencies is required? How will the Bureau of Land Management and the Park Service plan access to and interpretation of these features so that their activities are complementary but not duplicative? What areas should be interpreted and made accessible by viewpoints and trails? What personal services versus self-guided services should be made available to provide visitors a safe and interesting experience for visitors?

What common programs of protecting archeological and ethnographic sites are needed? What mutual coordination with local American Indians is required to meet the requirements of Public Law 100-225 and other laws and regulations?

Although these issues relate most directly to the NM 117 corridor, the problems of how to provide common programs for protecting archeological and ethnographic sites and natural resources are also issues for the entire national conservation area and national monument.

RELATIONSHIP TO THE *LAND PROTECTION PLAN*

The National Park Service has been charged by Congress with preservation and protection of park resources and with providing for use of park system areas by the visiting public. To this end, land protection plans are prepared to:

> Determine what land or interests in land need to be in public ownership, and what means of protection other than acquisition are available to achieve unit purposes as established by Congress.
>
> Inform landowners about NPS intentions for buying or protecting land through other means within the unit.
>
> Help managers identify priorities for making budget requests and allocating available funds to protect land and unit resources.
>
> Find opportunities to help protect the unit by cooperating with state or local governments, landowners, and the private sector.

The *Land Protection Plan* (NPS 1990b) for El Malpais National Monument was prepared by the NPS Southwest Regional Office separately but in coordination with this general management plan. The *Land Protection Plan* is an action element of this general management plan.

The El Malpais *Land Protection Plan* serves as a guide for what land or interests in land need to be in federal ownership, what means of protection are available to achieve the purpose of the monument as established by Congress, and what priorities for acquisition are appropriate. Approximately 18,500 acres of land within the authorized boundary of the monument (16 percent of the total monument) is

currently not in federal ownership (it is in private, state, and county ownerships). The *Land Protection Plan* proposes that all of this land be acquired by the Park Service in fee. The rationale for this proposal is fourfold.

> The natural resources of the monument are nationally significant and most are nonrenewable. Many resources are very fragile and require high levels of management and protection.
>
> The extensive cultural resources found in the monument are also fragile and nonrenewable. They constitute an important and scientifically significant data base, and their integrity must be preserved. This can best be accomplished through fee acquisition.
>
> Much of the monument land is sacred to the American Indians and is important in their traditions. Federal ownership must ensure access to the land for American Indian religious and traditional purposes over the long term. This access will not be guaranteed if the land remains in private ownership.
>
> There are relatively few areas suitable for administrative and visitor facilities because of the fragility of some volcanic features, the abundance of sacred and archeological sites, the religious importance attached to the land itself, and the rough, volcanic terrain. Most of the suitable areas are now in private ownership.

The *Land Protection Plan* identifies a number of issues that can affect the integrity of the monument's resources and the quality of the visitor experience. These issues include: incompatible uses that are occurring on nonfederal lands within the monument; protecting resources that are integral to the monument (some of which are currently on privately owned land); providing for optimal placement of visitor and management facilities; boundary adjustments; protecting potential wilderness areas for visitor enjoyment and proper land management; and conditions outside of the monument boundaries that can adversely affect monument lands or the visitor experience. These issues and solutions are discussed in detail in the *Land Protection Plan*.

APPENDIX C: MANAGEMENT ZONING – SUBZONING MANAGEMENT GUIDELINES

This appendix contains specific detailed guidelines for the management of subzones of the natural/cultural and monument development zones. The general management guidelines for these zones are presented in the "Management Zoning" section this document. (A description of the visitor experience relative to the standards of access and interpretation also appears in the "Management Zoning" section.)

NATURAL/CULTURAL ZONE

Primitive Subzone

General Overview. Visitors to this subzone will have occasional contact with other recreationists in a natural environment substantially devoid of contemporary human activity and influence. Manipulative resource management activities will be kept to a minimum. Natural processes will occur with minimum alteration or intrusion by humans. Most land that is identified as suitable for wilderness will be categorized in this subzone. The subzone will also include some land that is not classified as suitable for wilderness.

Visitor Use. This subzone is oriented toward the visitor who prefers a remote, wilderness-like experience. Use will be primarily by backcountry hikers. Challenge will be high.

The subzone will provide good opportunity for solitude during all times of the year. Contacts between parties will be infrequent to occasional. Evidence of recreational use will be minimal, but apparent in some isolated locations. Individual groups of monument visitors will be limited to a maximum of eight people.

The recreational use of backcountry areas in the primitive subzone will be controlled and monitored by a mandatory permit system. This system will be administered by NPS personnel at a staffed location (possibly the multiagency center or the Bandera visitor center). There will be no charge for the use permits.

All necessary rules and regulations will be communicated to visitors outside of the subzone.

No structured interpretation will occur within this subzone. Contact with NPS personnel will be minimal.

Access. The primitive subzone will be roadless. Existing roads and ways will be closed. Access will be by foot and other nonmotorized means only. Exceptions to this norm are detailed below. Travel will be predominantly cross-country, with some marked trails. Trails will be marked by rock cairns or by other natural, unobtrusive materials. Trails will have little or no constructed tread. Signs will be erected only where necessary to ensure the protection of resources or the safety of monument visitors. Orienteering and discovery will be encouraged in areas that can support visitor use. The hiking experience will not, in many instances, be oriented toward specific destinations or points of interest.

Access to the subzone by NPS personnel will also be limited to nonmotorized means, except in emergency situations such as fire suppression or search-and-rescue.

Grazing allottees within this subzone will be permitted reasonable motorized access along approved routes to maintain improvements (such as watering troughs, pipelines, and windmills) until the allotments expire. Motorized vehicles will not be used for routine access or herd management, although the use of horses or other pack animals will be permissible for these activities. The use of motorized vehicles will be prohibited on those federal lands in the primitive subzone that are determined to be suitable for wilderness.

American Indians may use horses and other pack animals to access areas in this subzone for the purpose of observing traditional practices of religion and subsistence activity. Certain areas may be periodically closed to the general public for short periods of time for the observance of traditional American Indian religious ceremonies. Consultation between the superintendent and American Indians will be necessary to arrange formal closures.

Facilities. No development will be present within this subzone (with the exception of permitted grazing improvements). However, some

undesirable human impacts that occurred prior to the monument's establishment may be apparent for some time.

Backcountry camping areas may be designated, however no tables, tent pads, or toilets will be provided.

Semi-Primitive Subzone

General Overview. Visitors to the semi-primitive subzone will have low to moderately frequent contacts with other recreationists. The setting of this subzone will be such that human activity and influence will be minimal, but evident. Manipulative resource management activities will be kept to a minimum, however management actions may be required where impacts from visitors occur. Natural processes will occur with little alteration by humans.

Visitor Use. This subzone will be oriented toward the visitor who wishes to reach relatively secluded areas of the monument without having to hike for extended distances. Challenge will be moderate. The subzone will provide encounters with many scenic, largely undisturbed areas of El Malpais, but will not provide the wilderness type of experience available in the primitive subzone.

Off-site interpretation and education will be stressed. Personal/portable interpretive media such as trail guides and pamphlets will be developed for use in this subzone. "On-site" interpretive panels or signing will be limited to those necessary for the protection of resources or for visitor safety. Ranger-led interpretive hikes will be permissible within this subzone.

Access. Access to the semi-primitive subzone will be moderate to difficult and restricted to those parties who are able to negotiate rugged, low-standard roadways or those who wish to hike into the areas. High-clearance vehicles and motorcycles will be appropriate modes of conveyance. Entrance to areas within this subzone will be clearly posted as impassable to two-wheel drive sedans and other low-clearance vehicles. Motorized vehicles will be restricted to travel on clearly defined but unimproved dirt roadways. Operation of motorized vehicles off established roadways will be prohibited.

Maintenance of roadways will be limited to that required to protect the terrain and other resources or the safety of the visitor. Some roads will be periodically impassable during rain and other wet periods.

NPS personnel may use motorized vehicles within the semi-primitive subzone for routine patrol and other management activities. Use of motor vehicles by NPS staff in this subzone will be restricted to established public and service roadways, except in emergency situations such as fire suppression or search-and-rescue.

Grazing allottees within this subzone will be permitted reasonable motorized access in areas not otherwise accessible by designated public roadways. Routes crossing federally owned lands will be approved by the superintendent. Use of these routes will be restricted to activities relating to the maintenance of grazing improvements (such as watering troughs, pipelines, and windmills) until the allotments expire. Motorized vehicles may be used for routine access or herd management, provided the vehicles remain on designated public roadways. Deviations from this standard will be the exception and must receive prior approval of the superintendent. The use of horses and other pack animals for routine access and herd management will also be permissible in this subzone.

American Indians may continue traditional motorized access to this subzone for the purpose of observing traditional religious and subsistence activities. When motorized access is required to areas of the monument not otherwise accessible by auto to the general public, consultation and agreement with the superintendent on the proposed route will be necessary. American Indians may also use horses and other pack animals within this subzone for religious and subsistence activities. Certain areas may be periodically closed to the general public for short periods of time for the observance of traditional American Indian religious activities. Prior consultation between the superintendent and American Indians will be necessary to arrange formal closures.

Facilities: Minor development will be allowed in this subzone when necessary for resource protection or visitor safety. Permitted grazing improvements will be allowed until allotments expire. Some improvements that occurred prior to the

establishment of the monument may be apparent for some time.

Any campsites within this subzone will be designated. Any high-use campsites (where visitor impacts require mitigation) may have fire rings as well as vault or chemical toilets.

MONUMENT DEVELOPMENT ZONE

Rustic Subzone

General Overview. Visitors to the rustic subzone will have frequent (moderate to high) contact with other recreationists during the peak-use season. Contacts will be relatively infrequent during the off season. A moderate level of resource management activity can be expected in this subzone to mitigate impacts associated with high visitor use levels. Natural processes will be maintained, but some human alterations and intrusions will be evident.

Visitor Use. Opportunities for solitude in the rustic subzone will be occasional to moderate during peak-season weekdays and off season weekends. Opportunities for solitude during peak-season weekends will be rare to occasional. Challenge will be low.

Visitors will be able to stay overnight in a designated rustic campground that will be designed to create a relatively high degree of solitude (although the level of seclusion will not approach that which can be experienced in the backcountry). For those who are not willing or able to manage the rigors of backcountry recreation, this subzone will provide an alternative chance to experience the natural beauty and resources of El Malpais. The subzone will also allow visitors to escape the more heavily developed and used areas of the developed subzone. Gravel roads will contribute to the perception of remoteness. Contact with NPS personnel will be moderate to frequent.

Off-site interpretation will be stressed; however low-profile outdoor exhibit panels and signs may be used at specially selected locations to provide information, ensure protection of monument resources, or provide for visitor safety. Ranger-led hikes will be permissible within this subzone.

Access: The rustic subzone will provide improved, gravel-surfaced roads that will be accessible by two-wheel drive, low-clearance vehicles. Access will be moderate to easy. NPS personnel will have full motorized access to this subzone on designated public or service roadways.

Grazing allottees within this subzone will be permitted reasonable motorized access to areas not otherwise accessible by designated public roadways. Routes crossing federally owned lands will be approved by the superintendent. Use of these routes will be restricted to activities relating to the maintenance of grazing improvements (such as watering troughs, pipelines, or windmills) until the allotments expire. Motorized vehicles may also be used for routine access or herd management, provided the vehicles remain on designated public roadways. Deviations from this standard will be the exception, and must receive prior approval of the superintendent. The use of horses and other pack animals for routine access or herd management will also be permissible in this subzone.

American Indians may use motorized access to areas of this subzone for the purpose of observing traditional religious and subsistence activities. When motorized access is required to areas of the monument not otherwise accessible by auto to the general public, prior consultation and agreement with the superintendent on the proposed route will be necessary. Horses and other pack animals may also be used within this subzone to provide access to the area for religious and subsistence activities. Certain areas may be periodically closed to the general public for short periods of time for the observance of traditional American Indian religious activities. Prior consultation between the superintendent and American Indians will be necessary to arrange formal closures.

Trails within the rustic subzone will generally conform to the standards presented for rustic trails in appendix D.

Facilities. Limited facility development in the form of modest interpretive shelters, low-profile interpretive panels and informational signs, trailheads, trails, and primitive vehicular campgrounds will be permissible.

Campgrounds will be accessible by automobile, however campsites will be limited to a modest size. This might limit the use of the campgrounds by larger RVs and trailers. Campsites could include fire rings, picnic tables, and vault or chemical

toilets. No potable water, electricity, or sewer connections will be provided within the campgrounds.

Developed Subzone

General Overview. Visitors to the developed subzone will have very frequent contact with other recreationists during the peak season. Contacts will be somewhat less frequent in the off season, but will still be high compared to other areas of the monument. A high level of resource management activity can be expected in this subzone to mitigate impacts associated with high levels of development and visitor use. Natural processes will be encouraged where possible, but significant alterations or intrusions by humans are likely to be evident.

Visitor Use. The developed subzone will provide the primary experience for the majority of visitors to El Malpais. There will be little or no opportunity for solitude during either the peak or off seasons. Interparty contacts in this subzone will be high. Contact with NPS personnel will be frequent. Challenge will be low.

Guided tours, interpretive trails, films, slide programs, exhibits, and publications will be used to convey an understanding of the resources of El Malpais. Orientation and information will also be provided to assist visitors in planning their stay in the monument and in west-central New Mexico.

Access. The developed subzone may have both surfaced and unsurfaced roads. All public roads will be accessible by two-wheel drive, low-clearance vehicles. Trails will allow visitors to discover a range of environments and features. If feasible, some of these trails will allow for access by individuals with mobility impairments.

Certain areas within this subzone may be periodically closed to the general public for short periods of time for the observance of traditional American Indian religious activities. Prior consultation between the superintendent and American Indians will be necessary to arrange such closures.

Facilities. All major facility development will be in this subzone. Comparatively significant modifications will be made to the environment; however, as much of the natural and cultural integrity of the area will be preserved as possible. Examples of facilities that will be included in the developed subzone are visitor centers, surfaced parking areas and roads, maintenance facilities, and housing.

APPENDIX D: TRAIL STANDARDS AND DETAILS OF TRAIL SYSTEM

INTRODUCTION

Trails in El Malpais National Monument will be built at four different standards, each corresponding to an approximate volume of use, maintenance priority, level of accessibility and skill, and the four subzone levels of visitor experience stated in the "Management Zoning" section. The standards were created to provide for public safety and offer a variety of trail experiences. Because El Malpais is a volcanic area, special lava flow trail construction strategies may be used with any of the four standards for reasons of public safety or resource protection.

PRIMITIVE TRAILS

Primitive trails will be marked routes for low volumes of experienced backcountry hikers. The trails will be used for access to backcountry resources and scenic areas. There will be no feature interpretation (with the exception of self-guiding publications) and trail markers or cairns will be commonly used for direction, visitor safety, and resource protection.

Primitive trails will have the lowest priority for maintenance. Trails will have little or no tread preparation, and only minor brushing to the tread margin, where necessary. Trails will have an overall grade of less than 15 percent and normally not exceed 20 percent for distances less than 150 feet. Width will not normally exceed 2 feet. Natural lava rock, unless it is extremely rough or abrupt and potentially dangerous, may serve as the walking surface. Some upgrade of the trail standard will be permitted if the route is in an ecologically sensitive area (i.e., wetland) or crosses brutal terrain.

SEMI-PRIMITIVE TRAILS

Semi-primitive trails will be hiking routes that can accommodate low to intermediate volumes of visitors who have intermediate to high ability and hiking experience. The well-marked trails will be primarily destination-oriented, serving as access to special resources and scenic areas, with minimal or no interpretation. Trail routes will be designed to provide for visitor safety while minimizing erosion.

Semi-primitive trails are third in maintenance priority. Often, the tread will not be smooth, having a natural dirt, rock, or cinder surface, and will be no less than 2 feet wide. Vegetation will be cleared 6 inches beyond the tread margin, where feasible. These trails may use footbridges, corduroy elements, and water bars. The overall grade will be less than 15 percent and not exceed 18 percent for distances less than 150 feet. Natural lava rock will be incorporated into the alignment unless the surface is extremely rough or there are abrupt and potentially dangerous grade changes. Where these trails ascend long steep slopes, they will be aligned carefully so as to minimize the potential for hikers to shortcut switchbacks.

RUSTIC TRAILS

Rustic trails can be hard-surfaced or gravel (cinder) routes that can accommodate intermediate to large volumes of visitors with average physical abilities to important attractions in the monument. Rustic trails will be well marked, and some interpretive information may be provided. They will be constructed to provide for visitor safety while minimizing erosion.

Rustic trails will have second priority for trail maintenance. Minimum tread width will be 3 feet, with the overall grade less than 10 percent and not to exceed 15 percent for distances less than 150 feet. Vegetation will be cleared 1 foot beyond the trail margin, where feasible. These trails may use footbridges, corduroy elements, and water bars, and have trail-side benches where needed. The trail tread will be relatively smooth and free of extreme variations and abrupt rock and root protrusions. Natural lava rock may be incorporated if the surface is hard and relatively smooth. Lava cinders may also be used as a trail surface. Careful attention to combine natural landscape materials and colors will always be a design and maintenance priority.

DEVELOPED TRAILS

Developed trails are hard-surfaced and meet Uniform Federal Accessibility Standards (UFAS), accommodating large volumes of people en route to popular destinations. All developed trails will be accessible to people in wheelchairs (unassisted) and will be carefully routed and constructed. A relatively large amount of interpretive information may be presented along these trails. These trails will provide for visitor convenience and minimal degradation of the natural and cultural resources. Because these trails may be heavily used by visitors with limited physical abilities, benches and shade/rain shelters will be incorporated along the route at strategic locations.

Developed trails will be given the highest maintenance priority. These trails will not exceed 5 percent (except that ramp sections will not exceed 8 percent). Tread width will be a minimum of 5 feet on one-way loops and 6 feet on two-way trails. These trails will drain well, with a cross slope not to exceed 2 percent. Vegetation will be cleared 1-1/2 feet beyond the tread margin, where feasible. Typical materials may include nonslip or aggregate concrete, asphalt, soil binders, boardwalks, and bridges in harmonious combination. Natural lava rock may be used for tread only if the surface texture and grade conform to UFAS. Lava cinders may be used with a translucent binder if feasible. Preference will be for natural landscape materials and colors to ensure compatibility and visual integrity.

Table D-1. Proposed Trail System at El Malpais National Monument – Standard and Length (mi)

Area/Name	Developed	Rustic	Semi-Primitive	Primitive
Multiagency Center				
View trail		0.5		
Bandera Crater Area				
Visitor center nature trail		0.5		
Dripping Lava Cave		0.6		
Lava Crater			0.5	
Sandstone Ridge			2.0	
Sandstone Ridge connector				0.8
Ice Cave**	0.2			
Lava surface features	0.5			
Bandera Crater*		0.5		
Bandera Crater connector		0.5		
Spattercone Valley				1.3
Spattercone Valley connector				1.1
Cerro Bandera connector				1.1
Cerro Bandera summit			1.0	
East Rendija Area				
Lava wall			1.3	
Four-Window/ Big Skylight caves			1.5	
Caterpillar/ Seven Bridges collapses				1.5
Braided Cave				0.4
El Calderon Area				
Junction Cave			<0.1	
Bat Cave	0.3			
Double Sinks	0.2			
Double Sinks-Junction Cave	0.2			
Zuni-Acoma				
Trail to overlook (west)	<0.1			
Zuni-Acoma*				7.0
Sandstone Bluffs	0.1			
Las Ventanas			1.5	
The Narrows				
Lava surface (wheelchair accessible)	0.1			
Lava surface (other)			0.3	
TOTALS	**1.7**	**2.6**	**8.2**	**13.2**

Note: Actual length and alignment may vary from those above because of terrain factors and resource protection needs. The future backcountry management plan may identify additional primitive trails that would be added.

* Existing, no change

** Upgrade existing trail

APPENDIX E: GENERAL DESIGN GUIDELINES

INTRODUCTION

The rugged beauty and deeply rooted cultural heritage of the El Malpais landscape should be complemented by a built environment (roads and facilities) that direct the visitor's attention toward the monument's resources. The goal of these guidelines is to encourage this attention with design consistency and visual quality that communicate a sense of place, including imitation of natural landscape patterns in developed areas and minimization of disturbance to ecological and cultural resources during design, construction, and maintenance.

Because El Malpais is a new national monument with relatively few structures of any type, maximum latitude will be given to the designers to research and develop facilities that reflect sensitivity to the cultural and ecological setting – with the reservation that select architectural and landscape architectural styles be repeated in other developed areas to link the overall visual image of the monument. Any new design should also be realistic in terms of functional requirements for today's management and operational needs and, because baseline data on resources and visitation is relatively lacking, include opportunities for functional flexibility.

The following sections provide an aid to the designer, contractor, Park Service official, and maintenance staff in the decision-making process concerning visual quality, design consistency, and resource sensitivity in the built environment. Designers are also encouraged to review the "Impacts of the Preferred Alternative" section prior to initiating schematic designs. It is recognized that during actual design of roads or facilities, case-by-case variances of some of the recommendations herein may be made to effect the most practicable design solutions.

ARCHITECTURAL ELEMENTS

Because there are no large facilities of any kind within the monument, an extensive study of regional vernacular architecture should be made prior to developing the schematic designs. Examples of regional mountain style architecture should be considered in designing buildings in the Bandera area. Buildings should be sited so that existing significant views or vistas are preserved. Structures should take advantage of available views, but also consider sight lines back to the structure. Placing a structure between an established or potential approach and a significant resource should be avoided. Native vegetation should be used to screen service areas as needed.

The design of the multiagency center may differ from that of the Bandera visitor center, primarily because of the climatic, scenic, functional, and operational needs. Facilities within the monument should rely on solar energy, where feasible. Water conservation is important, so water-conserving appliances and irrigation should be seriously considered. The following sections elaborate on major proposed facilities.

Major Public Facilities

The multiagency center should be built in a representative style of regional vernacular architecture. The building will be within 0.3 mile of the I-40 interchange area, lessening the expense of connecting utility lines to the city of Grants. The actual site should be adjacent to some minor variation in the otherwise flat landscape. The building's entrance should have a southwest orientation that is visible from the entrance road. Large shaded view windows should be used on southern exposures. Office windows should face the parking lot for security. A small shaded exterior public space should be designed as an element of the plaza for people to view the resource and rest.

Parking for the center should be screened from the entrance road and highway, if feasible. Native shade trees planted in large parking islands should be incorporated to relieve the intense summer heat on vehicles. Distinct spatial transitions should separate the parking area from the plaza and entrance area.

Solar orientation should be a major design factor in roof design (for possible photovoltaic cells), as should some regard for snow and heavy rain. Dense vegetative screening should be used near

the building to "seclude" it from the noisy interchange, and medium screening should be used along the right-of-way adjacent to the industrial park to break the lines of this development. A designated open vista to the south should also be available along the entrance road. Landscaping near the center should be a semi-formal mix of native plants (see Multiagency Center DCP).

The Bandera visitor center should be designed in a style representative of regional vernacular architecture. The building will be on a sparsely vegetated sandstone/volcanic cinder bench above and west of the lava flow margin. The entrance to the visitor center should have a southern exposure, and the view deck (approximately 500-600 sq ft) should face east, overlooking the lava flow, forest, Lava Crater, and Cerro Candelaria. The view deck may wrap around the building's south side.

The entrance area should be easily distinguishable and spatially distinct from the parking area. The parking area, broken into several smaller areas if feasible and located south or southwest of the building, should not interfere with the view of Lava Crater from the deck. The entrance area should have a separate small exterior public space for people to sit and relax.

Solar orientation should be used in roof design (for possible photovoltaic cells), as should a pitched roof to mitigate snow accumulation. The building should have large shaded view windows on the north, east, and part of the south side. Interior offices should have windows oriented south and west for security, and display areas should use the soft light of north-facing windows.

The trading post will be rehabilitated for orientation and meeting space. An exterior public space for relaxing should be provided in the picnic area and not adjacent to the trading post.

Site development and formal landscaping, including the proposed drop-off zone and walkways, should be subtle and not dominate the historical scene. Revegetation is needed in the trading post area. New trees, shrubs, and grasses should replicate, where feasible, the historical landscape (see "Landscape Architectural Elements").

Government Facilities

The residential area should be designed to encourage a sense of community among residents. Four single-family detached homes for permanent employees and one four-plex apartment building for seasonal employees will be built. Although obviously smaller in scale, the form, facade, color, materials, and texture should avoid inconsistency with the Bandera visitor center. Interior design should allow for individual family functional flexibility and views from windows. Views and roof angles (for possible photovoltaic cells) should be a prime consideration in specific site location.

Parking areas should be designed to decrease their noticeability. Landscaping for the new houses should incorporate native plants; preserve biotic diversity; define outdoor space; use native, drought-tolerant grasses for yards (each house should have its own private yard), and offer well-landscaped, distinct transitions from the parking areas to entryways. The residential area site plan should include a designated area away from the entry road for community recreation, e.g., a small turf area for volleyball, barbecue, etc.

The maintenance area, within 0.3 mile of the residential area, should consist of one large building and one small storage shed. The actual site should be topographically or vegetatively screened from the residential area and the Lava Crater viewpoint, if possible. The entrance should be on the south to minimize ice on entryways, and the roof should be oriented for possible installation of photovoltaic cells. The large building should include adequate room for firetruck and ambulance parking, dry material storage, a workshop, fire equipment storage, a unisex restroom, general supply storage, and enough space for several workstations.

The paved maintenance yard should include ample parking for vehicles, including firetrucks and heavy equipment. The yard should have a truck wash area, fuel pumps, and material storage area, and be fenced for security. The yard may be of a nontraditional shape to allow for preservation of vegetation. A helicopter landing area should also be considered during design.

The water storage and delivery system – wells, storage tanks, and water treatment facilities, including access roads – should be hidden from

public view. The partial or full burying of tanks should be considered and any remaining aboveground structure should be hidden with an appropriate facade or painted with earth tone and forest colors.

LANDSCAPE ARCHITECTURAL ELEMENTS

The design of roads, parking areas, trails, vegetation, vista clearings, and exterior public spaces should contribute as effective links between the natural form and the built form. This would be done by harmonizing the patterns and biotic diversities found in the landscape with the form, mass, scale, color, and textures of facilities. Although architectural styles may differ, signs, waysides, lighting, street furniture, trash receptacles, etc., should be similar in appearance throughout the monument. The following sections provide guidelines for major landscape elements.

Roads

Roads in the monument will be designed to interfere as little as possible with natural processes and biotic diversity. Although the preferred alternative's various development concept plans show suggested routes, much latitude should be taken to locate the actual alignments. The alignments should allow the driver to rhythmically focus on appealing views while peripheral distractions are screened (visual sequence). An appropriate visual sequence of the alignments should include scenic vistas, primary destinations, and eventually parking. This sequence should be accomplished without the need for a stop sign for through traffic.

Interior park roads will be designed for low-speed travel (25 mph maximum). Small turnouts should be incorporated to facilitate vehicles passing on long tangents or provide parking at points of interest. Vegetation patterns along the routes should be studied, and to the extent possible, replicated in the road embankments. During the design stage, the possibility of bike lanes will be considered.

Design suggestions for several of the major public roads are listed below:

1. The junction of the multiagency center entrance road with the interchange should be easily visible, but its junction with the parking area should be obscured from the driver heading toward the building. The road should turn toward the entrance, then curve north into the parking area. A small, bilateral roadside contact area of dense native screening will form a "gateway" to the center and help screen the parking area.

2. The junction of NM 53 with the Bandera visitor center entrance road should include deceleration/acceleration lanes. The view from the entrance road should first focus on the lava flow and ecotone, then the visitor center backdropped by Sandstone Ridge. Parking should be somewhat hidden behind the visitor center. The entrance road should meld into the one-way tour road without a stop sign but with opportunities to enter into the visitor center parking or turn around and return to NM 53. The proposed entrance road route will come close to the ecotone of aspens, pinyons, and junipers next to the west margin of the lava flow. Design alternatives should mitigate wherever possible the disruption of surface runoff patterns and the ecotone's water source.

3. The one-way Bandera tour road should be designed for low-speed (25 mph) and focus the driver's attention on views of the ecotone, the lava flow, Lava Crater, Cerro Candelaria, Cerro Bandera, Bandera Crater, and other scenic vistas. If determined feasible during design, pullouts should be added at scenic areas. The tour road should not have any stop signs until reaching NM 53, although it should have turn lanes for the Dripping Lava Cave road and the trading post parking area.

4. The Dripping Lava Cave road will be a short, two-way paved road leading to a parking area/trailhead. No pullouts should be necessary on this short road, and the parking area should be large enough to accommodate turning radii of tour buses. Widening the short road cut through the lava flow will be necessary, but careful attention to keep the cut natural looking should be specified in the design.

5. The realignment of County Road 42 (first 2 miles) should adhere to the form of the land and minimize interruption of ecological systems. Because parts of the road surface may be in the shade of Cerro Bandera during the winter

months, mitigation of snow accumulation should be considered in design and alignment.

Parking Areas

Parking layouts, like roads, should respond to the topography in a complementary form. Even though El Malpais does not require massive parking areas, arched or curvilinear layouts and small parking areas (rather than large asphalt areas) should be used to reduce the perceived size.

Large, vegetated parking islands should visually link native vegetation patterns with the built environment. Parking islands should be designed parallel to the line of foot travel toward the main destination they serve and should be wide enough to support a variety of native vegetation. To lessen the impact of trampling by visitors, islands can be shielded by

- increasing (or decreasing) the planting grade to the soil's angle of repose
- incorporating natural barriers, e.g., rocks and dense plant materials
- using subsurface irrigation techniques and soil treatments to combat compaction
- raising the curb height from the standard 6 inches

Snowpole holders are necessary in the design of all roads, walkways, and curbs and gutters.

Walkways

Pedestrian walkways should be spatially distinct from vehicular circulation and integrated into the landscape form. Safe walkways and paths should invite the visitor into well-defined use areas through a logical sequence of spatially distinct experiences and views; natural features should dominate where feasible. Edges of use areas should be well defined. Exterior public spaces, especially spaces adjacent to the entry of the visitor centers, should be spatially distinct and offer sitting areas, drinking fountains, and other amenities to invite the visitor to relax and enjoy the blend of the built and natural environments.

Vegetation

Trees and shrubs grown or transplanted from the natural environment should be considered for parking islands and general landscaping. Outside sources of native forbs and grasses should be approved by the park staff prior to use in revegetation.

In any planting scheme, careful attention should be given to the immediate environs. Although similar species are found at both the Bandera visitor center site and the trading post area, the pattern and frequency of natural distribution will be different, especially in the lava flow margin ecotones. Imitating the immediate environs helps mitigate disturbance of biological continuity and preserve the sense of place.

In areas of snow removal, conifers should be planted back from the road's edge to minimize denuding by the heavy snow loads caused by snowplows. Because roadside encroachment by new growth may be inevitable, a transplant program for young, unneeded trees should become a standard maintenance procedure.

Vista clearings are permissible to enhance the visitor's appreciation and understanding of the natural/cultural landscape. Proposed vista clearings should be reviewed by monument managers in consultation with a landscape architect.

Several criteria should be considered when clearing a vista.

- The key view areas along roads and trails, and at other facilities should be defined.
- The area to be cleared should be viewed from the key viewing area and from the area back toward the viewpoint. This is important because vegetative screening may be necessary to block undesirable elements in the return view, e.g., parked cars and utility lines.
- All trees and shrubs do not necessarily have to be removed. A representative diversity of tree heights and species may be necessary to minimize interference with ecological and biological systems. Vegetation under a specified height (generally young trees)

should be left alone and checked for height every five years.

Abrupt forest edges next to cleared areas should be avoided; a soft, graduated blending of clearing and forest should be used. The minimum length of a clearing should be established on an individual basis.

Once the initial major facilities are designed, a more refined set of design guidelines and maintenance procedures should be prepared to further protect visual quality and resource sensitivity in the monument.

APPENDIX F: VISITOR CENTER FUNCTIONS, SIZE REQUIREMENTS, AND INTERPRETATION DETAILS

MULTIAGENCY CENTER

Functions

As described in the proposed plan, the new visitor center will contain these functional areas for public use:

- Information/reception/circulation area
- Cooperating association sales and publication display area
- Travel planning area
- Exhibit area with audiovisual (AV) units, in alcoves and/or as part of an exhibit
- AV theater
- Plaza and start of short interpretive trail
- Public restrooms

The information/reception area will contain an information desk, orientation exhibits to features and activities in the area, a sales publication display area, and identification of the different agencies involved; it will also provide circulation space for visitors coming and going from the exhibit area, AV theater, and the travel planning area. It is important that the entrances to public restrooms be located so that this function does not add congestion to the information/reception area.

The sales and publication display area will be out of the main circulation area but in eye control of information desk personnel. Storage, safe, and workspace for the association will be near the sales area, and the cash register will be at the information desk.

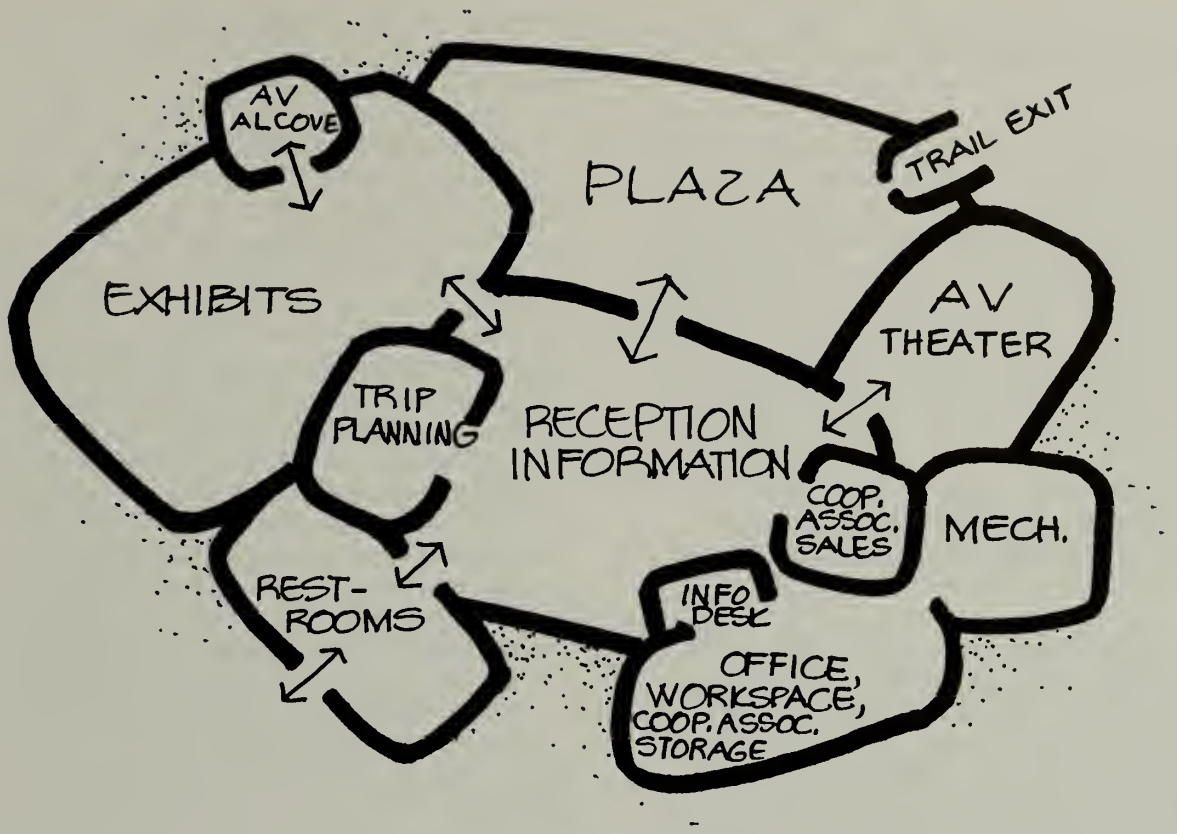
The travel planning area will be a self-service area/alcove off the reception/information area. Informal seating/work tables will be available for visitors developing travel plans. Basic free literature and maps covering the El Malpais, the Grants/Milan region, and the Masau Trail should be available, along with information relative to the amount of time/effort needed to visit and participate in each combination of areas or activities and relevant visitor safety and resource protection information.

A 50-seat AV theater will be located off the reception/information area. It will be used for showing a film about the Masau Trail as well as multiple offerings of other relevant AV programs dealing with the resources of the region.

A plaza adjoining the building, with informal seating (benches or a low wall), will serve as a meeting area for groups, a waiting area when some members of the group are using the trail or trip planning facility, an informal personal services area for occasional talks, and as a demonstration area for American Indian craftspersons. A short interpretive trail, for visitors to stretch their legs and get a visual orientation to the resource, will start from the plaza. Other amenities, such as a picnic area, outdoor amphitheater, and longer interpretive trails, will not be developed at the visitor center site. Instead, visitors will be directed to such facilities in the surrounding area.

A small office/working space for employees, located so that during the off season the employees manning the building can accomplish other work while also watching the information desk and sales area, will be a part of the center. An additional small office/work area/library will also be provided for employees and staff from other agencies or volunteers. This will be the limit of administrative space in the structure.

The following graphic shows the functional relationships in the public use spaces of the proposed new multiagency center.



Size

The following square footages were determined for the various functional areas in the center.

Information/reception/circulation	1,000 sq ft
Cooperating association sales and display	300 sq ft
Association storage and work space	200 sq ft
Travel planning area	500 sq ft
Exhibits, AV alcove	2,150 sq ft
AV theater	500 sq ft
Public restrooms (2-3 stalls for males, 4 for females)	600 sq ft
Office and workspace (office = 150, workspace = 200)	350 sq ft
Mechanical	600 sq ft
TOTAL	6,200 sq ft

These figures anticipate only office and workspace for the visitor center staff; office space for the management and administrative staff of the Park Service and/or the Bureau of Land Management will be provided in Grants.

Details of Interpretation

The opportunity to "experience the Southwest," its rugged landscapes and American Indian cultures - both prehistoric and contemporary - has long been the primary motivation for travel and tourism to this region of the country. The primary resources of the El Malpais National Monument and National Conservation Area, specifically mentioned in the establishing legislation, are the nationally significant Grants lava flow and the Las Ventanas Chacoan archeological site (the southernmost outlier site of the Chacoan culture) – the same primary motivating factors as for the Southwest in general. Therefore, the exhibit area in the visitor center will deal with the rugged landscapes and the human record of occupation from the prehistoric Chacoan and other Anasazi groups to the contemporary American Indian cultures of the area. Concentrating on these two primary interpretive themes will allow the center to present a core interpretive message applicable to the resources of the local region and the Masau Trail as well as those of El Malpais.

Masau Trail orientation exhibits will include a wall-sized stylized map of the Masau Trail, with large photo inserts of the different areas involved. Additional exhibits will be developed for each of the shorter 1- to 3-day loop routes, each focusing on a particular prehistoric cultural group and identified interpretive theme. There are eight such cultural groups identified in the preferred alternative for the Masau Trail, but there may be as many as 11 by the time the planning and trail layout is finalized.

In the interfaces of the reception area, trip planning area, and exhibit area could be large topographic relief models/graphics (orientational or interpretive) that depict

> the El Malpais lava field bounded by the Cebollita Mesa on the east and the Zuni uplift and Chain of Craters on the west
>
> the larger region – its primary landforms and resources – an area bounded by the Acoma and Laguna reservations to the east, the Ramah Navaho and Zuni reservations to the west, the Cibola National Forest and Chaco Cultural National Historical Park to the north, and the Cibola County boundary to the south

The depiction of the El Malpais lava field will be designed so that geology is a component, but the regional model/graphic unit will be primarily designed to orient visitors and interest them in traveling to the various sites depicted.

Exhibit planners and designers could keep in mind that the monument/conservation area will be changing rapidly, at least from the facilities development point of view. Initial information/ orientation panels may very well have to be changed more than once in the next five to 10 years. The same consideration holds for the Masau Trail.

Wayside exhibits will be located to interpret the resource visible from the plaza.

Outside the visitor center but protected from the weather there will be a bulletin board/information panel for posting information of a changeable nature. The need for after-hours information can be handled through this media. There will also be wayside exhibits explaining the resources, as appropriate, along the interpretive trail.

Exhibits will be produced on the following topics.

The Land

> **The Landscape** – The topographic relief model/graphics of the El Malpais area and region already described above for the interface of the reception/information area and the exhibit area could describe the landscape.
>
> **Geology –** Geology exhibits could include lava and other rock samples and graphics coupled with video units that demonstrate the major geomorphological events that created the landscape of today and their relationships to the various destination sites in the region, the El Malpais area and along the Masau Trail. Videos could be silent, perhaps with captions, and viewed by standing visitors. (Note: this exhibit should be designed more to encourage visitors to go see the "real thing" than to actually teach much about geology, but enough information should be included to encourage site visitation.)

The People

> **Cultural Groups** – There could be an exhibit to identify the American Indian cultural groups that have occupied this area (the Masau Trail region) from prehistoric times to the present using a combination of artifacts, photographs, and graphic materials. Current reservation boundaries as compared with earlier Indian territories could also be depicted.
>
> **Occupation History –** There could be a time duration and placement-in-history exhibit to introduce visitors to the long time span involved in the occupation and use of this area by the different cultures. The Acoma have lived in Sky City for about 800 years, in contrast to the approximate 400-year span for the entire colonial and national history of the United States; the early Anasazi cultures are even more ancient. The arrival and tenure of Europeans and the eventual BLM and NPS stewardship could be included in this time-line history. This exhibit could also place these cultural groups in world history, cross-referencing them with events that were occurring in other parts of the world (Central/South America, Europe, etc.) during the same time period.

Chacoan Outliers – One exhibit will present an overview of the Chaco era (A.D. 900-1150), identifying Las Ventanas as a Chacoan outlier and placing it in context with Chaco Canyon and the other 70+ Chacoan outliers in the region. This exhibit will create an awareness that Chaco Canyon (the hub of the Chaco civilization) and its outliers (detached units scattered over a 20,000-square-mile area) constituted a complex and far-reaching social, economic, and cultural system that was regional in nature and greater than the sum of its parts. The visitor will understand from the exhibit that these outliers were small communities with multistory dwellings, associated smaller (detached) dwellings, kivas, irrigation systems, connecting prehistoric roads, and signaling stations. The Las Ventanas site and features may then be contrasted with other outliers. Because there are more questions than answers, visitors may be encouraged to theorize what role Las Ventanas played in this regional system. An assortment of artifacts will support this exhibit, providing a rich visual association with this prehistoric period.

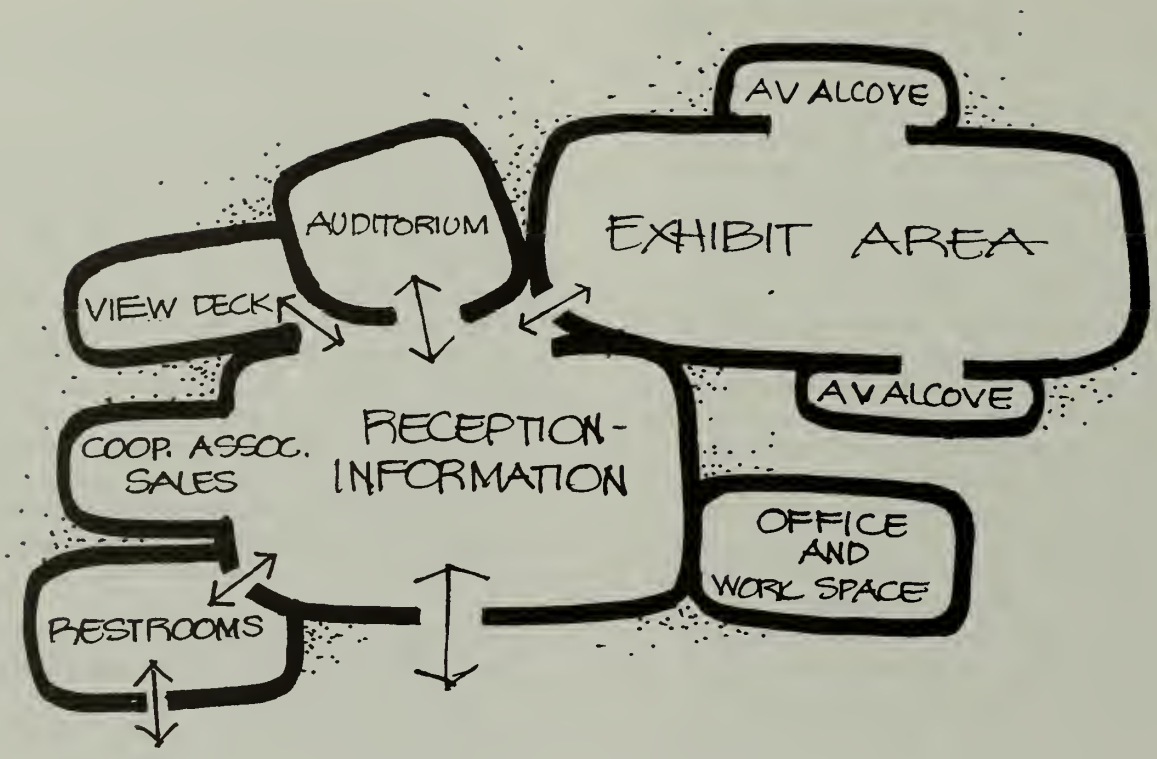
For the Sake of the People - For the Sake of the Land

A Special Place – An alcove in the exhibit area could be used for a video program that deals with the relationships, understandings, and feelings of the different peoples for this land – this "special place." The video could be structured around a panoramic scene of the El Malpais with a number of different speakers – representatives of the Acoma, Zuni, Ramah, and Laguna tribes, the Park Service, the Bureau of Land Management, ranchers, etc. – discussing what they see, feel, and value about the land. It would not be possible to teach or even cover superficially the differing philosophies or beliefs of the different peoples and/or organizations, and no attempt should be made to accomplish this. The objective should be to produce a kind of "Whitman Sampler" to point out that there are differences and that they are all valid within their context, that we should all respect others' viewpoints, and, most importantly, that we should respect the land and the resources we share in common. This exhibit could be very specific to El Malpais and its relationship to the region and to the Masau Trail, and this could be the overall message visitors gain from it.

The following quotes (extracted from notes taken during a meeting on October 17, 1988, between the Park Service, Bureau of Land Management, and representatives from the Acoma, Zuni, and Ramah Navaho tribes when discussing interpretation at El Malpais) are examples of the kinds of messages that this video exhibit could attempt to impart. (They are not offered as the text for the exhibit/video, but just as examples.)

> "When we look we feel that region. We want respect and love to come about, for people to know that there is a quality that is awesome, significant about the land and about himself." (Acoma)
>
> "...yes see the land and appreciate it, but know there is something else, that we share the responsibility to love it, to protect it, to respect it." (Acoma)
>
> "We need to develop a sense of responsibility. For the sake of the people, for the sake of the land, make people a part of the responsibility." (Acoma)
>
> "To learn to respect, to love the land takes a long time. Our people have been part of the land for so long; help people understand what this means." (Ramah)
>
> "Basically we all see the same, believe the same, except for the different interpretations that come from our different cultures". (Zuni)
>
> "This is a special place. What we want is for people to come to love it, to respect it. The land echoes in my mind, in my heart, in my spirit." (Acoma)

The program could last five minutes or less, be visitor-activated, and the alcove could be separated and buffered to prevent sound spill because of the narration.



BANDERA VISITOR CENTER

Function

As described in the proposed plan, the new visitor center will contain these functional areas for public use:

- –Information/reception/circulation area
- –Cooperating association sales and publication display area
- –Auditorium
- –Exhibit room
- –AV units, in alcoves and/or as part of an exhibit
- –View deck and start of short interpretive trail
- –NPS office space/workrooms and storage area
- –Public restrooms

The information/reception/circulation area of the visitor center will contain an information/reception desk and trip planning graphic (topographic map or model concept) that orients visitors to the national monument and conservation area. An exhibit will convey safety information and will be placed in a prominent location in the information/reception lobby. It is important that the entrances to public restrooms (accessible from both inside and outside the visitor center) be located so that this function does not add congestion in the information/reception space. Adequate circulation space will be provided for visitors coming and going from the exhibit area. The sales and publication display area will be out of the main circulation area but in view of the information desk personnel. Storage and a small work space for association personnel should be near the sales area.

The core experience for all visitors who stop at the visitor center will be the AV presentation. A 50-seat auditorium will be provided, and the exhibit area will complement the AV presentation by highlighting selected components that comprise El Malpais' cultural landscape.

Space will be provided for four NPS offices (one maintenance office and three ranger offices). The

visitor center will also provide a library/workroom space for NPS personnel, NPS storage space and conference room, a first aid room, and a small workroom/storage space for the cooperating association.

A small view deck with informal seating adjoining the building will serve as an area for visitors to relax in the out-of-doors before continuing their trip. This view deck will also serve as a trailhead for an interpretive trail that will take visitors to the edge of a lava flow and another trail that will lead to the top of Sandstone Ridge.

The functional relationships in public use spaces will be as follows:

Size

Information/reception/circulation	1,500 sq ft
Cooperative association sales and display	300 sq ft
Cooperative association storage/workspace	300 sq ft
Public restrooms	600 sq ft
Auditorium (100 seats)	1,000 sq ft
Exhibit area/video alcove space	1,500 sq ft
NPS office space (4 offices)	600 sq ft
Library/workroom	400 sq ft
Storage	400 sq ft
NPS restroom	200 sq ft
Conference room	200 sq ft
First aid room	50 sq ft
Mechanical	500 sq ft
	7,550 sq ft

Details of Interpretation

Audiovisual. The visitor center AV presentation will convey a distinctive mood and the message that El Malpais is a special place. This AV will be more than a geology story with a little human history thrown in. This rugged landscape will be portrayed in the "world view" where land and culture are one. The AV should invoke a feeling and attachment to both the landscape and the American Indian people who have occupied it over the past 1,000 years. This story will focus on El Malpais as a cultural landscape and will encourage the audience to "read" and appreciate this landscape and its creation, as well as the cultures that have been and are today inextricably part of its evolution. Religious activities, directional and geographic symbolism, legends, and storytelling (tribal assistance and review required) are all possible vehicles to portray portions of this story. The program will provide the audience a window into the world view of other cultures with the purpose of presenting the relationship between American Indian people and the land. If successful, subtle intangibles might pervade beyond this experience to encourage us all to look at things in a different way – with a deeper and continuing respect for all humans in our surroundings.

Exhibits. One portion of the exhibit area would emphasize the evolution of landforms. The El Malpais lava flows are among the most significant volcanic areas in the United States.

One exhibit will use techniques to give scale and dimension to this volcanic landscape, allowing the visitor to grasp the boundaries, expanse, and contrasts (sandstone formations vs. lava flows) of this unusual area. The Sandstone Bluffs site on NM 117 may be highlighted as the best location for a dramatic panorama of El Malpais.

Video units can be used to demonstrate the formation of the different types of lava surface features, lava tubes, and lava tube systems. For example, lava features at El Malpais may be shown, and then the same type of active features at Hawaii Volcanoes National Park may be spliced in to provide contrast (as is done at Lava Beds National Monument).

An exhibit/video technique will also show the sequence of individual flows at El Malpais, cross-referencing the time period of these flows with other regional, national, or international events in time.

Another exhibit will graphically identify and locate these different volcanic features and encourage personal discovery of these and other features.

Some of the most interesting ecological adaptations that plants and animals have made to survive in this harsh environment will be presented in an exhibit. Certain areas host enclaves of wildlife and plants especially adapted to conditions in El Malpais, including some species not commonly seen in the region. Briefly, the collage of topics may include the following:

Bats – Although visitors will not go into Bat Cave, they will be told about the bat flights at El Calderon. A few basic facts about their life cycle as it pertains to El Malpais will be provided.

Kipukas – Because these features are in more remote areas of the lava flows and are not easily accessible, most visitors may never see a kipuka. An exhibit will depict kipukas as islands in the middle of a sea of lava, showing them as elevated areas of older land surrounded by lava. A brief description of how kipukas are formed and the unusual habitats found within them may be discussed.

Inverted Life Zones – Visitors expect aspen trees growing in higher elevations where abundant moisture is available; they may be surprised to find aspens growing in this seemingly dry, barren lava landscape at elevations where they seem out of place. This exhibit will highlight this inverted life zone relationship, explaining why aspen grow at low elevations on or near the base of the lava with pinyon/juniper (species usually associated with desert-like habitats).

Diversity – Although the vegetation in El Malpais has been divided into three common vegetation communities – Douglas fir/ponderosa pine, pinyon/juniper, and Apacheplume – it should be noted that a wide variety of unusual plants and numerous microhabitats occur in this seemingly homogenous environment, hosting a number of faunal and floral species that would not normally occur in the area.

Dwarf Forests: Driving along NM 117, visitors will see the twisted trunks, gnarled bark, and the dwarf size of the trees on the lava surface. A brief explanation of this "bonsai" effect is needed.

Another portion of the exhibit area will complement the film by highlighting past and present cultures that have had contact with or have been directly influenced by the badlands (El Malpais) landscape. American Indian stories tell about the fire-rock and its effect on their lives. No attempt will be made to tell the entire story of any particular culture; however, visitors should grasp that this landscape has been viewed from the perspective of many different peoples. Graphics, artwork, poetry, photographs, appropriate objects, period artifacts, narrative support, and silent video inserts (if applicable) may be used in these exhibits to contrast and compare different cultures. These exhibits will be designed to stand alone and will not be viewed in sequence.

Another exhibit will interpret the post-Chacoan era (A.D. 1300-1540) up to and including the time of European contact. This exhibit will focus on the late prehistoric period, which witnessed the shift from scattered regional settlements characteristic of the Chaco era (A.D. 900-1150) to large aggregated communities more like modern-day pueblos. This aggregate settlement period had its own distinctive regional art style, and artifacts will be used to further contrast this cultural transition. The exhibit may highlight the year 1540, which marked the end of the prehistoric period in the Southwest. (Spanish exploration and settlement and the introduction of European diseases, new crops, and domestic animals forever changed traditional American Indian patterns of adaptation.)

An exhibit will interpret those contemporary American Indian cultures that have direct ties to El Malpais. Because some of the large prehistoric communities are recognized as ancestral villages by modern Pueblo people, this exhibit will complete the cultural continuum initiated by the Chaco era exhibit. Working closely with the various tribes, the appropriate exhibit materials, artifacts, and scripts will portray the importance of El Malpais from the perspective of the Acoma, Zuni, Laguna, and Navajo. This exhibit will be designed to stand alone; however, a small associated demonstration area can be used at appropriate times to allow visitors to learn firsthand about the customs, crafts, literature, poetry, and perspectives of the native inhabitants.

Publications will be provided to interpret selected historical and contemporary happenings – a calendar of events that has some tie to El Malpais. Theme treatments will be brief and read like newspaper headlines, with pictures and minimum narrative. Visitors will be intrigued by the procession of history that has passed within view of

these badlands. There will be information about specific publications for in-depth treatment of any particular subject. Topics may include the following:

Exploration –

- Coronado's expedition to the Seven Cities of Cibola skirted segments of El Malpais. (1540)
- The Dominguez-Escalante expedition (seeking a route to link New Mexico with the northern empire of California) camped at McCartys. (1776)

Western Expansion –

- The Whipple expedition (to find suitable transcontinental railroad routes) described El Malpais firsthand as a "whole length of valley...threaded by a sinuous stream of lava." (1853)
- The Beale expedition (to locate a wagon route to the Pacific) described El Malpais as a crossing of "many streams of lava, which appear to have rolled in a fiery torrent just as a mountain stream from the hills." (1857)

Settlement, Economic Diversity, and Expansion –

- Homesteading and the coming of the railroad brought the first hint of "civilization" to El Malpais, permitting the Anglo culture to gain an economic foothold that attracted a slow but steady increase in population. With this new economic era came some of that old wild West charm, with railroad workers, ranchers, cowboys, Basque sheepherders, sodbusters, gold seekers, and lumberjacks. This melting pot of characters all thrived in El Malpais area during the late 1800s and early 1900s.

El Malpais in the Twentieth Century –

- The 20th century brought little stability to the economy of the area. Various agricultural endeavors and mining for fluorspar, pumice, and uranium brought only temporary relief from a cycle of economic recessions. In 1942 El Malpais was used as a bombing range. Today, with the establishment of the monument/conservation area, local residents hope that tourism will improve the regional economy.

View Deck/Trailhead. A wayside exhibit on the interpretive trail from the view deck may identify the flow as "aa" and explain its formation and source. One panel may explain the abundance and variety of the vegetation (ecotone) that grows along the lava edge because of the higher concentrations of moisture. A connecting short loop trail near a portion of the lava flow will give visitors a chance to see a lava flow first hand.

This view deck will also serve as a trailhead for access to Sandstone Ridge. Visitors will travel a strenuous trail to the top and be rewarded with panoramic views of the Bandera Crater area, commanding views of lava in the foreground, and distant views of the other volcanic terrain. Wayside exhibit panel(s) will identify major geographic points of interest with specific attention to features that may have special value to American Indians. From the overlook, visitors may take a trail down the west side of Sandstone Ridge to the Bandera Crater/Ice Cave trailhead.

APPENDIX G: COMPLIANCE WITH CULTURAL RESOURCES REQUIREMENTS

Compliance Actions

All proposed actions will comply with section 106 of the 1966 National Historic Preservation Act as amended (16 U.S.C. 470 et seq.), its implementing regulations, and applicable cultural resources legislation through NPS-28, "Guidelines for Cultural Resources Management."

Proposals in this general management plan will affect sites and areas that are on or may be determined eligible for listing in the National Register of Historic Places. To ensure that proposals for these properties comply with provisions of section 106, the Advisory Council on Historic Preservation, and the New Mexico State Historic Preservation Office have been invited to participate in the El Malpais planning process.

Representatives of the New Mexico State Historic Preservation Office (SHPO) and the Advisory Council met with staff from the National Park Service and Bureau of Land Management for briefings on the general management plan alternatives and resources management sections to give them an opportunity to understand the alternatives and to offer their comments and insights on the process.

On-site meetings at El Malpais with representatives of the New Mexico SHPO aided in evaluating the integrity and national register significance of structures and sites in the vicinity of Bandera Crater and of the multiagency center near Grants, New Mexico. Both the New Mexico SHPO and the Advisory Council will also have the opportunity to review and comment on the draft general management plan. This participation satisfies the requirements of section 106 of the National Historic Preservation Act, as amended.

Between April 1988 and February 1989, NPS and BLM planners met several times with the Acoma, Zuni, and Ramah Navajo, and contacted Laguna Pueblo as part of the public involvement process. Discussions centered around American Indian concerns regarding continued access for traditional use of resources, protection of sites, prevention of visitor trespass, and facilities development. These meetings were highly productive, contributing to increased communication and understanding among all groups concerned.

Basic Guidance

Basic guidance for management of the monument lies in its enabling legislation, included as appendix A, and from the general regulations that guide NPS operations and management contained in 36 Code of Federal Regulations (CFR). A discussion of the requirements of the enabling legislation is included in the "Requirements, Issues, and Concerns" section.

Relevant laws and regulations pertaining to cultural resources management are itemized in NPS-28, "Cultural Resources Management Guidelines." The NPS *Management Policies* (1988) also provide a basic summary of cultural resources management requirements. For purposes of this general management plan, the following items are deemed the most important.

The National Environmental Policy Act of 1969 (Public Law 91-190, 83 Stat. 852; 42 U.S.C. 4321 et seq.) and its implementing regulations (40 CFR, parts 1500-1508), which direct the federal government to preserve important historic, cultural, and natural aspects of our national heritage.

The National Historic Preservation Act of 1966 as amended (Public Law 89-665; 80 Stat. 915; 16 U.S.C. 470; amended by various public laws including 96-515) declared a national policy of historic preservation. Among other provisos, section 106 of this act requires that the Advisory Council on Historic Preservation be afforded an opportunity to comment on any undertaking that affects properties listed on or eligible for the National Register of Historic Places. Section 110 of this act provides that "prior to acquiring, constructing, or leasing buildings for purposes of carrying out agency responsibilities, each Federal agency shall use to the maximum extent feasible, historic properties available to the agency." Amendments to this act in 1980 stressed the responsibility to preserve and

conserve the intangible elements of our cultural heritage such as arts, skills, folklife, and folkways. **Executive Order 11593,** incorporated into NHPA by amendment, provides for federal leadership in preserving the nation's cultural environment and requires agencies to inventory cultural resources on lands under their control or affected by their programs and nominate eligible resources to the National Register.

Protection of Historic and Cultural Properties (36 CFR 800) gives the step-by-step procedures to be followed by federal agencies to ensure that undertakings under their control are in compliance with the 1966 National Historic Preservation Act.

Management and protection of archeological resources are more specifically outlined in

The Antiquities Act of 1906 (Public Law 59-209, 34 Stat. 225; 16 U.S.C. 431 et seq.)

The Archeological Resources Protection Act of 1979 as amended (Public Law 96-95, 93 Stat. 721, 16 U.S.C. 470 aa-ii) and the implementing regulations (43 CFR 7) provide for sanctions against persons convicted of removal, defacement, and/or sale of cultural resources from federal lands. Recently enacted revisions (Public Law 100-555, 102 Stat. 2778; and Public Law 100-558, 102 Stat. 2983) to this act require that federal land managers establish programs to increase public awareness of the significance of archeological resources located on public lands. The former law also emphasizes the preservation and long-term scientific use of archeological resources, including survey of "lands that are likely to contain the most scientifically valuable archeological resources." These revisions also lower the threshold under which penalties may be assessed and require agencies to have a schedule and plan for survey of cultural resources.

Special Directive 87-3 "Conservation of Archeological Resources" deals with the basic dichotomy between the NPS mandate to preserve archeological sites unimpaired for future generations and the necessity to excavate sites to acquire mission-oriented information or materials (i.e., those needed for scientific information, interpretation, or excavations that are done to rescue data that are threatened by visitor activities, natural causes, or development approved as part of the general management planning process.) This directive also stresses NPS responsibility for proper and timely curation, including provisions for adequate funding as part of projects.

Especially relevant to management of El Malpais are the various laws, rules, regulations, etc. that deal with American Indian relationships. Primary among these are

The American Indian Religious Freedom Act; Public Law 95-341 (92 Stat. 469, 42 U.S.C. 1996), which protects and preserves the right of American Indians to pursue traditional religious activities. As a corollary to this act, 1988 NPS *Management Policies* outline procedures for dealing with a variety of American Indian issues and require park managers to engage in the identification of and consultation with American Indian groups traditionally associated with park lands and other resources.

Staff Directive 88-1 (October 13, 1988) **"Public Access to NPS Cultural Resources Management Bibliography Reports and Confidentiality of Archeological and Ethnographic Resources Information"** provides direction for review and certification of NPS bibliographic materials and outlines the provisions for protection of confidential cultural resources information, noting that federal land managers shall not make available to the public information concerning the characteristics and location of any archeological or ethnographical resources where such information release may risk harm to the resources or sites.

Other guidance is provided by

Special Directive 85-4 "Procedures for the Museum Collections Repository Western Archeological and Conservation Center, Tucson"

Special Directive 80-1 "Guidance for Meeting NPS Presentation and Protection Standards for Museum Collections"

"Archeology and Historic Preservation: Secretary of Interior's Standards and Guidelines" 1983 (48 *Federal Register* 44716)

Management of Museums Act of 1955 (Public Law 84-127; 69 Stat. 242; 16 U.S.C. 18f)

APPENDIX H: CULTURAL RESOURCES INVESTIGATIONS, INVENTORIES, AND SPECIAL STUDIES AND GUIDES NEEDED AT EL MALPAIS

Because El Malpais is a new area, a number of investigations, inventories, and special studies and guides are needed. These include the following:

a resources management plan (action plan) built upon the cultural and natural resources management sections of this general management plan

a cultural landscape study

a research plan

monumentwide cultural resources surveys, including archeological surveys of historic and prehistoric sites:[2]

- update old site forms and conduct ground-truthing of sites
- determine which rock cairns, stone bridges, and other trail elements, walls, circles, and cists are prehistoric or associated with contemporary American Indian groups or are more recent additions by pothunters or monument managers
- locate, document, and evaluate historic and prehistoric ways and trails across the badlands

archeological overview and assessment[3]

archeological evaluation study

cultural resources base map

a historic resources study

a scope of collections statement

collections management plan

collections storage plan

historic furnishings report (for interpretation of Candelaria cabin)

historic structures reports for the trading post complex and the prehistoric structures at Las Ventanas

condition assessment report for the tower kiva at Las Ventanas

an enhanced ethnographic program as defined by NPS-28 (2: 16, 22), which should include the following:

- ethnographic assessment[4]
- traditional [resource] use study (ethnobotanical study)
- ethnographic oral histories and other anthropological studies of human lifeways
- ethnohistory

In addition, data from these various surveys and inventories need to be included in one of several NPS-wide cultural resource inventories:

a list of classified structures, encompassing both historic and prehistoric structures

cultural sites inventory (consisting of prehistoric and historic archeological resources and contemporary ethnographic resources, as appropriate)

national catalog of museum objects, encompassing all cultural and natural history objects in El Malpais collections

2. See the previous comments in "The Plan for Cultural Resources Management" section regarding release of site-specific information.

3. Arthur Ireland's cultural prehistory study (NPS 1988a) is an excellent beginning for an expanded archeological overview/assessment.

4. The Holmes report (BLM 1989) fits some of the NPS-28 criteria for an ethnographic overview/assessment.

APPENDIX I: CULTURAL RESOURCES RESEARCH AT EL MALPAIS

Research Rationale. The enabling legislation, the Archeological Resources Protection Act, and NPS policies and guidelines provide for basic and applied scientific research to support management of cultural resources. NPS-28 also describes research documents and procedures, provides technical guidance, and sets standards for research projects of all types. Research is needed to identify and evaluate important resources and develop adequate management strategies.

Resources preserved in the nation's national parks and monuments form an immense and significant research pool for scientists from many disciplines. Data gained from research in El Malpais can benefit not only the monument, the conservation area, and surrounding areas, but has far broader implications to science on a national and global scale. NPS *Management Policies* (1988) provide for NPS support and assistance to researchers doing cooperative and independent research relevant to NPS needs. Appendix 13 to NPS-53, "Special Park Use," outlines procedures for archeological research in NPS areas by qualified individuals, museums, and scientific and educational institutions.[5]

Types of Research. Several types of cultural resource research are needed at El Malpais. The first, compliance-related research, deals with the inventory, documentation, and evaluation of resources prior to development or visitor activities that will affect these resources. However, the location, scale, and type of development or use may restrict the scientific inquiry, and research may be limited to the minimum necessary to evaluate significance of a specific site or structure or to recover limited scientific data. Second, effective long-range resource management will also depend on research to identify, document, and evaluate cultural resources, establishing a comprehensive data base for El Malpais.

The last type of research, broad-based scientific inquiry, may also be done in concert with specific development, compliance, or inventory activities, but more often it is of a thematic nature and focused upon specific, relevant research questions.

Development of a Research Plan. A research plan will be developed for El Malpais to generate and express the rationale behind proposed future research, including compliance activities, thematic scientific inquiry, and creation of a comprehensive cultural resources data base. The plan will define the scope, priorities, and research strategies that will be employed at El Malpais. It will also structure and guide the various activities performed during the cultural resources inventory and evaluation process, link all these activities to defined goals, and outline realistic expectations and feasible schedules.

The research plan will also integrate resource inventories and evaluations from different disciplines. It will be the vehicle to unite the various small compliance-related projects to better overall understanding of the entire monument research program; prevent cumulative impacts to sites; guide future specific research designs; and serve as an efficient and comprehensive tool to help comply with section 106 of the National Historic Preservation Act.

The plan will incorporate results of other research in the region when developing project proposals. The El Malpais research plan will be coordinated with BLM research efforts and recognize direction set by the New Mexico State Historic Preservation Office as outlined in two publications: *Prehistoric New Mexico: Background for Survey* (Stuart and Gauthier 1981), and the *Comprehensive Plan for New Mexico's Statewide Architectural Survey* (Hicks et al. 1985). The "Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation" (48 *Federal Register* 44716) and NPS-28 provide direction for identifying, documenting, and evaluating cultural resources, and for planning historic preservation in general.

Research topics relevant to the management of El Malpais may include such things as further

5. Nondestructive archeological investigations, including use of existing collections, would be more appropriate than large-scale excavation.

examination of Las Ventanas as part of the Chacoan system; relationships between volcanic eruptions and human land use patterns, including dating of lava flows; integration of archeological data to illuminate prehistoric environmental manipulation and specialized adaptations; definitions of special relationships among lava features and traditional uses; development of reliable cultural chronologies applicable to the El Malpais region; examination of changes in area cultures following the collapse of the Chacoan system; and determination of profiles of past environmental conditions.

APPENDIX J: DESCRIPTION OF WORK TO BE PERFORMED BY ADDITIONAL STAFF

Division of Management and Administration

Purchasing Agent GS-07 FTE 1.0	This position will be needed to prepare and process purchasing documents. An extraordinary level of purchasing and contracting will be necessary as this new area is being developed.

Division of Visitor Services and Resource Management

Resource Management Specialist (Fire/Vegetation) GS-07 FTE 1.0	This position will be needed to continue inventory and analysis of the area's natural and cultural resources, including establishment and monitoring of vegetation transects within the monument.
Park Ranger (Interpretation) GS-07 FTE 1.0	This position will be needed to develop and implement interpretive programs for the east district, including the activities of the multiagency visitor center. Interpretive activities will require extensive coordination with Indian groups of the area.
Park Ranger (General) GS-05 FTE 3.0	These positions will be necessary to provide essential visitor services at the visitor centers. They will provide frontcountry patrol in the areas around Bandera Crater, the loop road, and the multiagency center.
Park Rangers (Seasonal) GS-04 FTE 0.5 Park Ranger (Seasonal) GS-03 FTE 0.8	These positions will be required to provide a full range of visitor services (such as interpretation, protection, and backcountry patrol). These positions are necessary to provide for a full-week operation with expanded hours during the months of higher visitation. At least one seasonal will have extensive knowledge of the American Indians' perspectives of El Malpais. This individual will provide staff and visitors with an expanded awareness of American Indian issues.
Dispatcher/Clerk GS-04 FTE 1.0	This position will maintain radio operation at headquarters to monitor routine and emergency communications with the field. This individual will also provide routine preparation of reports, time cards, and correspondence for the division.

Maintenance Mechanic (Buildings & Utilities) WG-09 FTE 1.0	This position will be needed to maintain the facilities and infrastructure at the multiagency center and the Bandera visitor center. The employee will also service buildings and utilities at the employee housing complex.
Maintenance Worker WG-05 FTE 1.0	This position will be necessary to perform inspection and general maintenance of facilities at East Rendija, El Calderon, the Bandera Crater area, and the west half of the Zuni-Acoma Trail. The individual will also perform campground and trail maintenance in the west district.

APPENDIX K: VISITOR IMPACT AND MONITORING MANAGEMENT PROGRAM FOR ARCHES NATIONAL PARK, UTAH[6]

INTRODUCTION

A major planning and management goal for Arches National Park is to provide for amounts and types of visitor use consistent with management objectives for park resources and visitor experiences. The best way to prevent the degradation of resources or experiences and avoid costly long-term corrective management is to identify the potential impacts of development and public use. The Arches Visitor Impact Management program, based on a process developed for the National Parks and Conservation Association (Graefe et. al 1987), will help managers identify and predict impacts and determine visitor carrying capacities for different park resources.

The principle of visitor impact management has long been an integral part of NPS resource management practices. Thus, the VIM program will not introduce a new management concept, but it will provide a formalized framework for applying the concept to all aspects of visitor use.

PROCESS OUTLINE AND EXAMPLE

The VIM process is guided by management objectives and standards of acceptable change for key impact indicators. Management strategies are developed to address impacts identified through comparison of existing conditions with the standards of acceptable change. An outline of the VIM process, with an example of how the process can be applied, is shown in the accompanying chart. The description of indicator monitoring has been simplified in the example.

The VIM program will address impact management in backcountry and frontcountry areas. Impact indicator standards and management strategies will be based on the type of resource management and visitor experiences specified by park management objectives. These management objectives may vary for each area of the park. For example, in a backcountry area, where management objectives strive to provide the visitor a sense of remoteness and solitude and where vegetation damage and development are unacceptable, management may opt to redirect visitors to other areas rather than harden or modify the site.

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6. This appendix summarizes the parts of the VIM program proposed in the Arches *General Management Plan* that could apply to El Malpais. Some of the examples have been reworded to reflect the characteristics of El Malpais resources; these changes are indicated in brackets.

PROCESS	EXAMPLE
Review Management Objectives	
Review park management objectives and revise as appropriate as part of updating The park's *Statement for Management*	At the areas of most concentrated activity, accommodate the increasing demand for visitor use in a relatively structured environment while preserving park resources and a desirable visitor experience
Product: up-to-date statements of resource and visitor experience objectives for specific park areas	
Review Existing Data Base	
Identify information required to address management objectives when implementing the VIM program	Initiate vegetation study and visitor survey
Product: list of research inventory and data collection needs	
Select Key Impact Indicators	
Identify measurable ecological and social variables relevant to management objectives	Percent vegetation cover (this is one of several impact indicators that would be used)
Product: impact indicator list with units of measurement	
Develop Standards for Key Impact Indicators	
Based on management objectives, describe minimum acceptable conditions for each impact indicator	No more than 10% reduction in vegetation cover due to trampling from visitor use
Product: quantitative statements of minimum acceptable degradation limits that can be monitored	
Compare Standards with Existing Conditions	
Field assessment of impact indicators	Existing – 15% reduction Standard – 10% reduction
Product: determination of consistency or discrepancy of existing conditions with impact indicator standards	DISCREPANCY

PROCESS	EXAMPLE
Identify Probable Causes of Impacts	
Examine visitor use patterns and other potential causes of impacts	Visitors not staying on trails because of inadequate trail definition
Product: description of causes of discrepancies	
Identify Alternative Management Strategies	
Examine the full range of direct and indirect management strategies that could be used to correct discrepancies	(a) improve trail definition through control structures or hardening (b) encourage visitors to stay on trails through interpretation
Product: description of potential management strategies	(c) revegetate damaged areas (d) redirect visitors to other areas (e) close trail to use
Management Decision and Implementation	
Implement and monitor the effectiveness of management strategies	Combination of (a), (b), and (c) (improve trail definition, use interpretation to encourage staying on trails, and revegetate damaged areas)
Product: action plans and implementation	Monitor

POTENTIAL IMPACT INDICATORS

The VIM program will address three main elements: natural resources (including flora, fauna, soils, [geologic resources], and air and water quality); cultural resources (including archeological [ethnographic] and historic resources); and visitor use (including distribution, expectations, and preferences).

Impact indicators and acceptable impact standards will vary for different areas depending on established management objectives for those areas. Following is a list of potential resource and visitor experience indicators.

Natural Resource Indicators

Water quality (e.g. fecal coliform/strep, chemistry, turbidity/sediment load)

Soil compaction, infiltration, bulk density

Erosion

Presence of pest faunal species (e.g., beggar rodents and birds, ants and other insects)

Presence and vigor of small mammals, reptiles, ungulates, and predators (e.g., number of species, number of individuals, population structure)

Percent vegetation cover

Vegetative vigor (e.g., reproductive structures, disease, breakage, age structure)

Vegetative species composition (e.g., exotics, resistant species, woody vs. herbaceous species)

Presence and vigor of sensitive resources (e.g., raptors, threatened and endangered species, unique and rare plants)

[Geologic resources (e.g., damage to fragile volcanic resources including cave formations)]

Cultural Resource Indicators

Presence of significant undisturbed cultural deposits

Presence of sites possessing sensitive artifacts and/or features

Evidence of illegal surface collection, excavation, or malicious vandalism

Evidence of trailing or trampling through sites

[Visitor interference in the practice of American Indian religion and subsistence]

Degree of structural stability (of historic structures)

Visitor Experience Indicators

Number of encounters with others visitors (e.g., per day, per hour, by location, by size of group)

Amount of conflict caused by encounters with different visitor types (e.g. involved in different activities, using different modes of transportation)

Perception of crowding

Perception of impact on environment (e.g., litter, erosion, graffiti)

Perception of level of development

Perception of noise level

Number of visitor complaints

Number of visitors not returning to an area because of dissatisfaction with changes in management or level of development

APPENDIX L: ESTIMATED CLASS "C" CONSTRUCTION COSTS

Description	Gross Costs (in thousands)
Multiagency Center	
New orientation center	$2,184
Paved parking	89
Paved entrance road	234
Telephone/electric	61
Sewer/water	546
Trail	32
Intersection improvements	11
Landscaping/site development	214
Signs	8
Subtotal	**$3,379**
Bandera Crater/Lava Crater Area	
Buildings	
New visitor center	$2,340
Rehabilitate trading post	117
4-bay maintenance building	684
4 single-family residences	624
4-unit seasonal employee apartment building	262
Parking	
Paved maintenance yard	47
Paved residential parking	16
Paved visitor center parking	97
Trading post parking	99
Paved Dripping Lava Cave parking	81
Roads	
Paved entrance road	819
Paved tour road	2,184
Paved maintenance/residential road	624
Trails	
Visitor center nature trail	32
Lava surface features trail	56
Ice Cave trail	35
Bandera Crater trail	30
Bandera Crater connector trail	32
Dripping Lava Cave trail	16
Lava Crater trail	17
Sandstone Ridge trail	115
Sandstone Ridge connector trail	45
Trail inside Dripping Lava Cave	20
Spattercone Valley connector trail	36
Cerro Bandera summit trail	42
Cerro Bandera connector trail	49
Spattercone Valley trail	47
Utilities	
Telephone/electric	211
Water system (well, tank, system)	936
Septic system	133
Miscellaneous	
Stairs at Ice Cave	47
Handicap viewdeck at Ice Cave	32
Stairs at Dripping Lava Cave	147
Maintenance yard fence	9
View deck at visitor center	23
Intersection improvements	156
Landscaping, site development	537
Signs (road, directional)	31
Remove noncontributing existing structures	31
Other walks and paths	17
Rehabilitate borrow/cinder pits	312
Picnic area	6
Subtotal	**11,390**
East Rendija Area	
Gravel, new county road 42 realignment	1,248
Gravel, improve other parts of County Road 42	624
Obliterate and restore 2 miles of County Road 42	78
Gravel spur road to Cerro Bandera	63
Gravel parking at Cerro Bandera	8
Gravel spur road to primitive campground	312
Campground, primitive	72
Vault toilets in campground	32
Gravel parking at lava wall trailhead	8
Loop trail at lava wall	42
Gravel parking at East Rendija	19
Trail to Big Skylight Cave, Four-Window Cave	44
Trail to Caterpillar Collapse, Seven Bridges	22
Vault toilets at trailhead	32
Intersection improvements at NM 53 junction	16
Landscaping, revegetation	16
Signs	3
Subtotal	**2,639**

El Calderon Area	
Gravel existing El Calderon road	468
Gravel road Junction Cave to Bat Cave trailhead	283
Gravel parking at Bat Cave trailhead	19
Vault toilets at trailhead	32
Bat Cave trail	16
Parking lot/Double Sinks/Junction Cave trail	11
Gravel parking at Junction Cave	7
Obliterate, restore El Corral road (3 mi)	119
Obliterate, restore Bat Cave road (1 mi)	39
Intersection improvements at NM 53 junction	16
Design viewing area	1
Landscaping	8
Signs	24
Subtotal	**1,043**
Zuni-Acoma Trail	
Pave two existing gravel parking spaces for handicapped	3
Obliterate, restore two parking spaces	3
Realign, make handicap-accessible trail to viewpoint	3
Subtotal	**9**
Acoma-Zuni Trail	
New paved spur road and parking	105
Intersection improvements	8
Landscaping	4
Signs	9
Connecting trail	5
Subtotal	**131**
Sandstone Bluffs/Las Ventanas	
Realign and pave road to Sandstone Bluffs	1,989
Pave new Las Ventanas spur road	117
Pave parking at Sandstone Bluffs	52
Pave parking at Las Ventanas	13
Obliterate, revegetate 10 parking spaces at Sandstone Bluffs	16
Trail to Las Ventanas	52
Trail, handicap-accessible at Sandstone Bluffs	14
Handicap-accessible vault toilet	47
Overlook deck	13
Lockable entrance gate	3
Intersection improvements with NM 117	8
Landscaping	5
Signs	24
Subtotal	**2,353**
The Narrows	
New paved spur road	58
Paved parking	13
Handicap-accessible trail to overlook	19
Loop trail to lava surface features	22
Intersection improvements with NM 117	8
Landscaping	5
Signs	16
Subtotal	**141**
Summary Subtotals	
Multiagency center	3,379
Bandera Crater/Lava Crater area	11,390
East Rendija area	2,639
El Calderon area	1,043
Zuni-Acoma trail	9
Acoma-Zuni Trail	131
Sandstone Bluffs/Las Ventanas	2,353
The Narrows	141
TOTAL	**$20,887 ***

* Does not include Harpers Ferry Center costs for interpretive media in visitor center or for wayside exhibits

APPENDIX M: PRINCIPAL LAVA FEATURES IN THE NATIONAL MONUMENT

Following are definitions of the more common surface and subsurface features in the lava flows of El Malpais National Monument, particularly the features present on the youngest Bandera and McCartys flows that are the least weathered and most easily interpreted to the public.

At El Malpais there are three structural/textural varieties of lava surfaces. These are common around the world in volcanic rocks of basaltic composition (the names of the first two types are words of Hawaiian origin):

pahoehoe – relatively smooth surface, sometimes almost pavement-like, but usually with undulations, sinuous folds, and densely clustered ropelike structures that show how the fluid lava solidified. This type of lava is the easiest to walk on.

aa – irregular surface composed of rough broken masses and often jagged spinous pieces of lava that are mostly a foot or less in diameter. Along with many fissures, these features make aa lava very difficult to walk on.

blocky – extremely irregular surface with large angular rock masses typically exceeding a foot in diameter, and sometimes exceeding 6 feet. Blocky lava is a tortuous "up and down" terrain, exceedingly slow and difficult to traverse.

All three types are common in the Bandera flow where they are frequently observed in close proximity. By far, the most common type in the McCartys flow is pahoehoe, which makes accessible parts of this flow comparatively easy to traverse, except in areas where there are large sags and pressure ridges.

Spattercones (hornitos), well-represented on the Bandera flow, are formed when fluid lava beneath a hardening surface is ejected upward through holes and builds up towerlike structures. These structures are typically composed of small hardened blobs of lava, and they may be semihollow and interlaced with miniature lava flows, holes, and windows; they often have interesting dripping-lava textures.

Tree molds form when lava engulfs a tree or log and the wood burns out rapidly, leaving cylindrical holes in the flow surface. Tree molds are known on both the Bandera and McCartys flows, but are particularly common near Bandera Crater where there is a very unusual tree-trunk squeeze-up (Lindsey 1949a).

Squeeze-ups form when viscous lava is extruded through an opening in the solidified crust (Nichols 1939, 421). Nichols identifies two types common in the McCartys flow: *bulbous squeeze-ups* representing upward extrusion of lava through vents on the flow, resulting in knobby and bulblike structures, and *linear squeeze-ups* representing upward extrusion of lava along cracks. (The linear type is frequently in the form of long, wedge-shaped masses up to a few feet high along the centers of widely opened crevices, and they may show vertical grooves and flutes.) Many fragments of *grooved lava* common to the ruptured pahoehoe crusts of the McCarty flow are attributed by Nichols (1938, 609) to the squeeze-up phenomenon. Squeeze-ups are present, but not nearly as common, in the pahoehoe surfaces of the Bandera flow.

Pressure ridges common to the McCartys pahoehoe flow, and less common in the Bandera flow, are formed when the movement of the flow beneath the surface continues and the more rigid hardened crust above buckles into elongated ridges and splits. The axes of these ridges are oriented either parallel or transverse to the direction of flow.

Surface sags and sinks developed in both the Bandera and McCartys flows in spots where fluid lava drained out from below and the hot, semiplastic crust drooped into the resulting voids. In some places these voids were so large that the entire surface fragmented and fell into collapse depressions. In the Bandera flow, several such depressions are truly enormous. Where large subterranean lava tubes or groups of tubes collapsed, parallel-walled collapse structures were formed.

Lava walls refer to places along flow edges where the lava was sufficiently viscous to build up to a considerable height – in places 70 feet above the adjacent terrain.

Kipukas (a Hawaiian term) are hills to slight swells that were surrounded by lava flows. Thus, kipukas are islands of older terrain within lava flows. They vary from very small to hundreds of acres, and they are found by the dozens in the McCartys, Bandera, and older flows. Kipukas commonly have vegetatively rich lava-edge ecotones, and because some have underlying rock other than lava and have been isolated from access by wildlife, livestock, and humans, they may be islands of unusual biologic composition or diversity.

The origin of large and extensive systems of **lava tubes** and the interesting diversity of rock structures and textures related to them, is discussed in the "Affected Environment" section on geology in the draft plan. (Lava tubes are also called lava caves.) However, it is important here to distinguish between the deeper tubes that drained the center of an entire solidifying lava flow and much smaller tubes, termed **surface tubes**, that are common on pahoehoe lava surfaces and are only of local extent. Surface tubes may be a few feet to only inches in diameter, are seldom more than a few dozen feet long, and are often sinuous and break into miniature lava flows of very interesting shape. Surface tubes are very common on the pahoehoe flows in the vicinity of Bandera Crater.

Ice caves in El Malpais are simply portions of lava tubes near or beneath the groundwater table that are of the requisite configuration and depth to capture winter air and maintain subfreezing conditions through the warmer seasons. Lava rock is a superb natural insulating material, and there are well over a hundred caves and deep crevices in the Bandera and other flows that contain year-round ice. Some of these caves contain floors and walls of ice, ice crystals and "blades," icicles, and ice "bats" or stalagmites. Because the entrances to ice caves are cool throughout the warmer growing season, some support concentrations of ferns, mosses, lichen, and algae that would not otherwise be common at this elevation and latitude. It should be noted that prehistoric human use of El Malpais flows is commonly associated with sources of water and ice. Therefore, archeological sites may be dense where ice caves and icewater springs occur in tubes and sinks in the lava.

APPENDIX N: SUMMARY OF PRE-DRAFT PLAN PUBLIC INVOLVEMENT

Public involvement is an integral component in the formulation of any NPS general management plan. The Park Service is dependent on the public for knowledge, opinions, and advice to facilitate the success of the planning process. Public involvement for the El Malpais National Monument general management plan has been encouraged in a number of ways, including newsletters, workbooks, and public workshops, meetings, and open houses. Public input is also very important to the Bureau of Land Management. Many issues that affect planning for El Malpais influence both the national monument and the national conservation area. Thus, in most instances, the two agencies have coordinated their public involvement processes.

The two agencies have jointly printed a series of newsletters to inform the public of the progress and status of planning. The newsletters (*El Malpais Update*) have been sent to more than 800 individuals and organizations on a periodic basis. All individuals who own property in the monument or conservation area receive the *Update*, as well as area residents. Elected representatives and other public officials; local, state, and federal government agencies; American Indian and conservation groups; and anyone else who has expressed a desire also receives the newsletter. Issues of the newsletter have discussed such topics as the legislative background of El Malpais, the planning process, data-gathering activities, planning issues, safeguarding the cultural heritage, and land protection planning. The newsletters have also announced the times and locations of public meetings, workshops, and open houses.

The first public meetings were held in Grants, New Mexico, on June 15, 1988, and in Albuquerque, New Mexico, on June 16, 1988, to solicit public input on the issues that should be addressed in the NPS and BLM general management plans. About 50 individuals attended these two meetings. Questions and concerns were identified in many areas, including American Indian issues, recreation, land acquisition and restrictions, wilderness and road closures, facility development, wildlife management, grazing, cultural resource management, and natural resource management. The issues identified at these meetings were analyzed and then integrated by the planning teams into the preliminary alternatives for management of the monument and conservation area.

These preliminary alternatives and development options for the monument and conservation area were presented in the *Update* published in early December 1988. Public input on these concepts was solicited in the *Update* through the inclusion of workbooks that presented the NPS and BLM preliminary alternatives in a tabular format. This format allowed easy comparison and included a response form for the public to express their opinions on the most appropriate development and management actions. Workbooks were mailed to everyone on the *Update* mailing list.

Although the NPS alternatives were formulated in consideration of the monument as a whole, the workbook presented the specific elements of each alternative by individual geographic area. Respondents were asked to select the one alternative for each geographic area that most closely matched what they felt would be the most appropriate level of development for that area. A no-action/maintain existing conditions option was included for each area. Space was also provided for respondents to provide further comment or to suggest their own alternatives.

A total of 55 completed NPS workbooks were returned. Although this low response rate did not allow for accurate statistical analysis of the data, the workbooks did provide insight into the public's opinions on the appropriate level of development at El Malpais National Monument. Workbook responses indicated a distinct public preference for those alternatives that emphasized a higher level of facility development and a dispersal of visitor use.

On December 14 and 15, 1988, a second round of public meetings was held in Grants and Albuquerque. Open houses were also held in both cities on the afternoon prior to the actual meetings. The purpose of these open houses and meetings was to present and seek public response to the preliminary alternatives. Approximately 75 individuals attended the December meetings and open houses.

On several occasions members of the planning team met with officials of the Acoma, Ramah Navajo, and Zuni tribes to discuss in detail what tribal concerns should be addressed during planning.

Two meetings (four workshops) were held specifically in regard to the multiagency visitor center. The results can be found in the appendix G of the *Draft General Management Plan/Environmental Assessment/Wilderness Suitability Study*.

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