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general management /  
development concept plan  
june 1982

WUPATKI AND SUNSET CRATER



NATIONAL MONUMENTS / ARIZONA

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June 18, 1982

GENERAL MANAGEMENT/DEVELOPMENT CONCEPT PLAN

Wupatki and Sunset Crater National Monuments  
Arizona

National Park Service  
U.S. Department of the Interior

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## INTRODUCTION

### PURPOSE OF THE PLAN

The purpose of this General Management/Development Concept Plan is to establish an integrated set of proposals for resource management, visitor use, park operations, and development for Wupatki and Sunset Crater national monuments. This document will guide the management of the monuments for the next 10 to 15 years. The plan was prepared to comply with the NPS Organic Act, the General Authorities Act, the proclamations establishing the monuments, the National Environmental Policy Act, the National Historic Preservation Act, the Endangered Species Act, and other applicable laws, regulations, and policies.

### PLANNING CONSIDERATIONS

Wupatki National Monument was established by a presidential proclamation in 1924 as a two-piece area to preserve the Citadel and Wupatki prehistoric ruins. The monument was subsequently enlarged by another presidential proclamation in 1937 and by Public Law 87-136 in 1961 to preserve additional archeological resources. The monument currently comprises 35,253 acres between the Coconino National Forest and Navajo Reservation.

Sunset Crater National Monument was also established by a presidential proclamation in 1930 to preserve the extinct cinder cone and surrounding black lava and cinders as examples of the eruptions that influenced a prehistoric people. This monument includes 3,040 acres completely surrounded by the Coconino National Forest.

Since the two monuments are located in close proximity to each other, they are jointly administered under one superintendent. The General Management/Development Concept Plan includes both national monuments, viewing them as interrelated resources to be managed with a comprehensive approach.

From 1968 to 1971, Wupatki, Sunset Crater, and Walnut Canyon national monuments were under the administrative supervision of a general superintendent's office in Flagstaff, Arizona. From 1971 to 1973, Wupatki and Sunset Crater were under the administrative supervision of the superintendent of Grand Canyon National Park. However, Wupatki and Sunset Crater were then placed under a superintendent at Wupatki and a general superintendent in Farmington, New Mexico. Walnut Canyon is now administered by a ranger-in-charge under a general superintendent in Phoenix. In December 1980, planning representatives discussed the feasibility of changing regional boundaries and placing Walnut Canyon, Wupatki, and Sunset Crater under one superintendent in Flagstaff. Pursuit of this concept was terminated because of fiscal, political, and other practical reasons.

## PLANNING ISSUES

Specific issues were identified for analysis at the inception of the General Management/Development Concept Plan planning effort in 1980. These issues included (1) where the headquarters of the monuments should be located; (2) who should manage adjacent Forest Service lands important to the monuments; (3) how uncontrolled grazing could be reduced in Wupatki; (4) what the interpretive relationship of the monuments should be; (5) how natural and cultural resources should be managed; (6) what types of visitor use and facility improvements were needed; and (7) how to protect lands in Wupatki that contain outstanding mineral rights.

## MANAGEMENT OBJECTIVES

The management objectives for Wupatki and Sunset Crater national monuments are as follows:

to preserve and maintain the cultural and natural features of the monuments

to provide visitors with educational, enjoyable, and enlightening experiences, so they may gain environmental awareness and insight into the cultural and natural features of both monuments

to cooperate with the Navajo Tribe, the Forest Service, other federal agencies, the state of Arizona, and local agencies in programs for natural and cultural resources conservation and outdoor recreation in the surrounding region

to encourage a continuing research program, which will provide management with guidance needed for accurate and informative interpretation of the natural and cultural aspects of the monuments



WUPATKI VISITOR CENTER / HEADQUARTERS



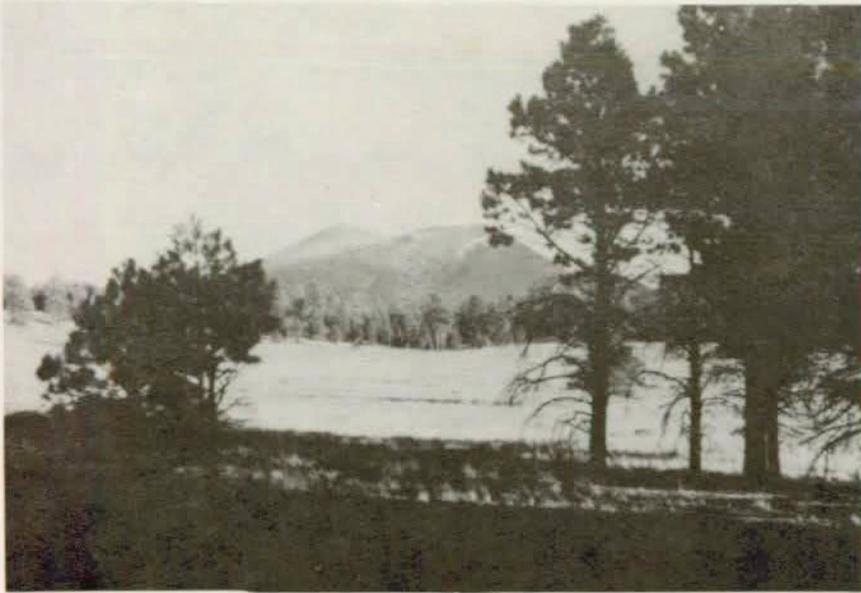
WUPATKI RUIN / VISITOR CENTER / HEADQUARTERS



WUKOKI RUIN



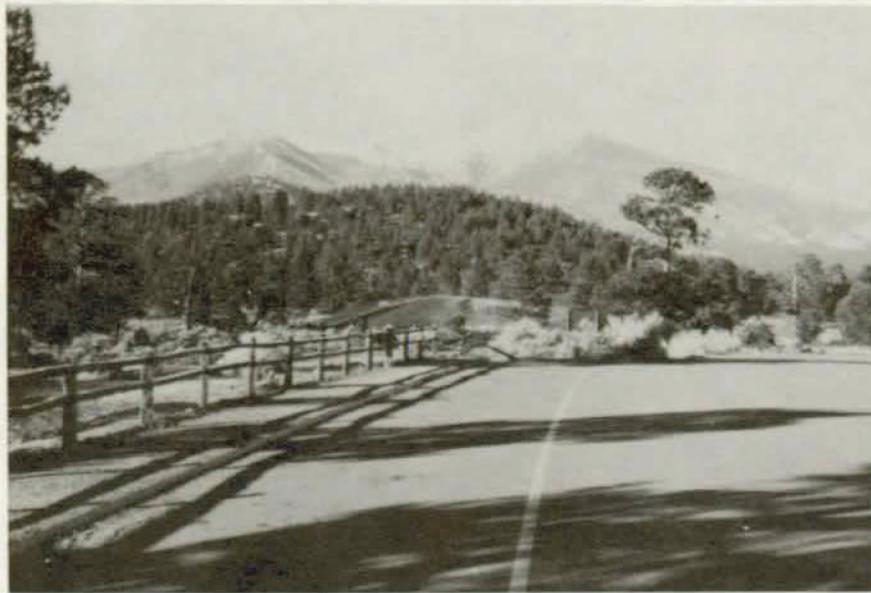
LOMAKI RUIN



SUNSET CRATER

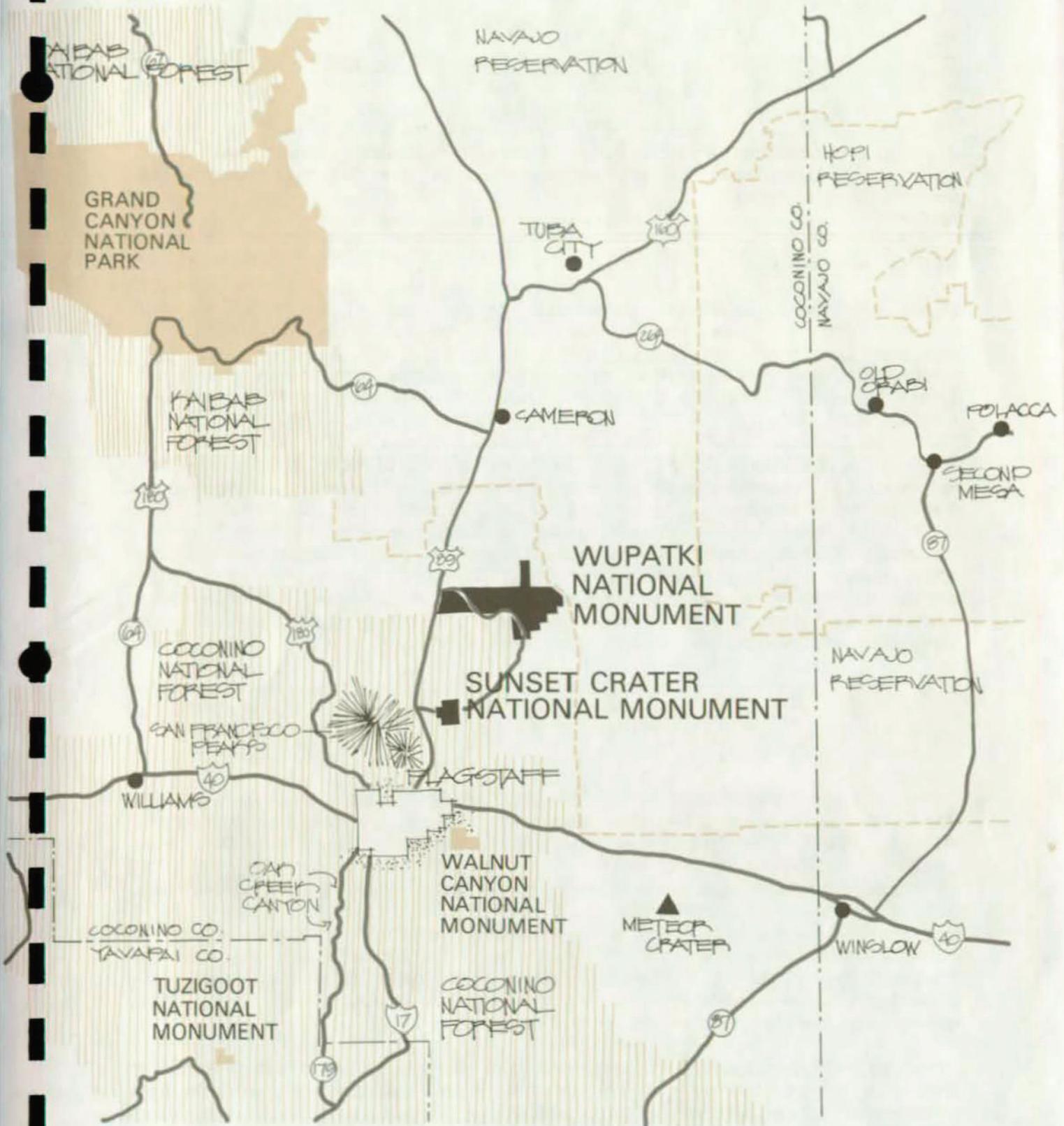


SUNSET CRATER VISITOR CENTER



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# REGION

WUPATKI AND SUNSET CRATER  
NATIONAL MONUMENTS / ARIZONA

UNITED STATES DEPARTMENT OF THE INTERIOR  
NATIONAL PARK SERVICE

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## EXISTING CONDITIONS

Following is a brief description of the environment of Sunset Crater and Wupatki national monuments, as it relates to the planning proposals. For additional details, see the documents cited in the "Selected References" section of this report.

### REGIONAL CONTEXT

Expansive high deserts, mountains, mesas, and remnants of volcanic activity form the landscape of the region. Sunset Crater and Wupatki lie between the high elevated national forests to the southwest and the semidesert lands of the Hopi and Navajo reservations to the northeast. These national forests and Indian lands dominate northern Arizona (see Region map).

Phoenix, a rapidly growing metropolitan complex of over a million people, is located 177 miles south of Wupatki National Monument. Flagstaff, a major nearby community, had a 1980 population of 33,000 people. It is located 18 miles southwest of Sunset Crater and 44 miles from Wupatki. Flagstaff is the economic center for the region, where numerous services are provided for the extensive ranching, lumber, and tourist activities of northern Arizona. The area between Flagstaff and Sunset Crater is being subjected to increasing residential and business development. The remainder of the region surrounding the monuments is sparsely populated.

U.S. 89, a major north-south route through Arizona and Utah, provides access to the parks from Flagstaff, which is served by Amtrak rail service, bus service, commuter airlines, and private vehicles via interstates 40 and 17.

Other visitor attractions in the region include Grand Canyon National Park, Walnut Canyon National Monument, Tuzigoot National Monument, Meteor Crater, Oak Creek Canyon, and numerous recreational facilities of Coconino National Forest. Recreational opportunities range from downhill and cross-country skiing to hiking, hunting, visiting archeological sites, nature study, and sight-seeing.

Land use in the region varies from the expanding urban influences of Flagstaff near Sunset Crater to low intensity grazing at Wupatki. The Coconino National Forest is under multiple use management; the primary uses near the monuments are recreation and grazing.

Information from the U.S. Geological Survey indicates that some lands in the area of the monuments are prospectively valuable for oil and gas, geothermal steam, and associated geothermal resources. Based on present information, there are no additional valuable leasable minerals. Because of the lack of surface indicia and drilling data, the potential for geothermal energy development and for discovery of oil and gas in the area is unknown at the present time. The Coconino National Forest and adjacent region are currently being studied by the U.S. Geological

Survey and private corporations for potential geothermal development. Permits have been granted by the Forest Service to energy-related firms for research on FS lands adjacent to the Wupatki boundary.

Of the locatable minerals, cinder, pumice, gypsum, miscellaneous clays, sulphur, and uranium have been reported in the area surrounding the parks, and the findings of meteorites and meteorite diamond have been reported in the vicinity. It is unknown to what extent, if any, these minerals exist at commercially valuable levels in the monuments. A cinder quarry operation is located outside Sunset Crater northwest of the visitor center. The haul road for this operation crosses the main park road (FS road 545) near U.S. 89.

### NATURAL RESOURCES

The primary resource of Sunset Crater National Monument is the extinct 1,000-foot volcanic cinder cone that developed in A.D. 1064 to 1065 and its associated black lava flows, cinders, and smaller volcanic features. An ice cave formed in a 225-foot-long lava tube located near the base of Sunset Crater.

The dominant vegetation at Sunset Crater is a mature open ponderosa pine forest. About 50 percent of the monument is barren or semibarren cinder fields. Other tree species include limited numbers of quaking aspen, Utah juniper, and pinyon pine. The vegetation also includes shrubs and other plants typical of a transition zone.

Wildlife at Sunset Crater include Abert squirrel, pronghorn antelope, mule-deer, badger, gray fox, coyote, jackrabbit, cottontail, bobcat, chipmunk, porcupine, raccoon, skunk, rock squirrel, bats, a few reptiles, resident birds, and several migratory birds.

There are no known plants or animals inhabiting Sunset Crater National Monument that are on or proposed for listing on the U.S. Fish and Wildlife Service's endangered and threatened species list.

Sunset Crater has no permanent streams or springs. Water-table depth is estimated at about 2,000 feet. Flooding is not a problem. There are no prime or unique farmlands in the monument. The elevation of the monument ranges from 6,800 to 8,000 feet, resulting in cool summer temperatures with intermittent extremes. During the winter, heavy snows and considerable drifting can occur, but maximum snowpack seldom exceeds 36 inches. Annual precipitation averages about 18 inches.

The natural resources of Wupatki National Monument are dominated by the high desert-mesa landscape. Blowholes and earthcracks are surface indications of an extensive, interconnected system of joints and cracks found in the Kaibab limestone formation. Blowholes are small openings that show cyclic movement of air in and out of the underground system. Earthcracks are larger openings, the Sipapu crack is 500 feet deep. Citadel sink, just south of the Citadel ruin and nearly 200 feet deep, is either a very large earthcrack or the result of a cavern collapse. The most significant physiographic feature of Wupatki is the Doney ridge

(Antelope cliffs), which is an exposed fault line scarp running in a northeast-southwest line through the monument.

Vegetation is typical of the high desert of northern Arizona. The western half of Wupatki is mesa country dominated by blue and black grama grasses, with an open woodland of one-seed juniper along the southern boundary. The eastern half of the monument, extending to the Little Colorado River, is desert-shrub including rabbitbrush, snakeweed, saltbush, Mormon tea, and Apache-plume. Exotic species such as tamarisk and camelthorn are encroaching on the native species near the river. Because of decades of domestic livestock grazing, lands near the Little Colorado River support only limited vegetative cover.

The CO Bar Cattle Company currently has a twenty-year grazing permit on about 16,000 acres in the western half of Wupatki; the permit expires in 1983. Based on traditional use, in 1980 two Navajo families were granted ten-year renewable permits for grazing the eastern half of the monument.

Wildlife include coyote, pronghorn antelope, porcupine, badger, bobcat, gray fox, jackrabbit, ground squirrel, various reptiles, and several bird species. Mule deer visit occasionally during the winter months.

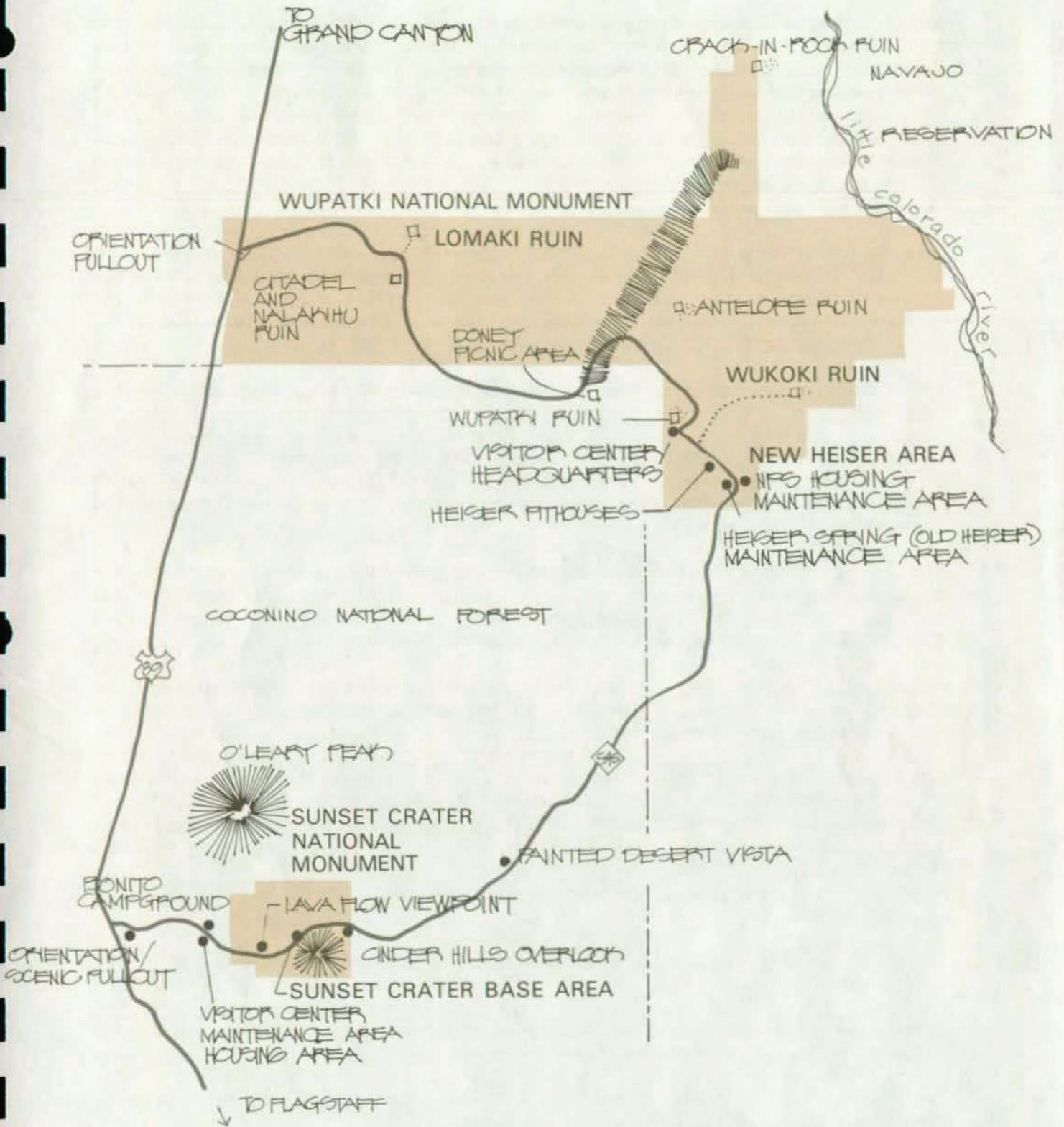
There are no known plants or animals on the FWS endangered and threatened species list inhabiting Wupatki on a year-round or transient basis. However, seven species of plants currently under review by the Fish and Wildlife Service for placing on the protected species list are either known to or may occur at Wupatki. These are Hedeoma diffusum, Amsonia peeblesii, Encelia frutescens, Phacelia welshii, Penstemon virgatus var. pseudoputus, Astragalus lentiginosus var. ambiguus, and Coryphantha vivipara var. rosea.

There are a few springs but no permanent streams in the monument. Water-table depth is estimated at about 1,700 feet. Flooding is infrequent and is not a problem at existing developments. There are no prime or unique farmlands in Wupatki. The elevation ranges between 4,300 and 5,600 feet, resulting in warm dry summers and moderately cold winters. Average annual rainfall is about 7 or 8 inches. Snowfall is erratic, with negligible drifting. Strong winds from the southwest occur in spring and early summer.

### CULTURAL RESOURCES

Sunset Crater National Monument and adjacent FS lands contain remains of prehistoric pithouses, dating prior to and after the eruptions of Sunset Crater in A.D. 1064 to 1065. The greatest concentration of these pithouse sites is west of Sunset Crater, outside the monument. The monument does not contain any cultural resources listed on or determined eligible for the National Register of Historic Places. Sunset Crater has religious meaning to the Navajo and Hopi peoples; an ice cave near the crater has religious significance to the Hopi.

The primary cultural resource of Wupatki National Monument is the large concentration of significant archeological ruins. The monument may



# EXISTING CONDITIONS

WUPATKI AND SUNSET CRATER NATIONAL MONUMENTS/ ARIZONA  
 UNITED STATES DEPARTMENT OF THE INTERIOR/  
 NATIONAL PARK SERVICE

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contain over 2,500 prehistoric sites that generally date from A.D. 1070 to 1250 (information based on NPS 1981 survey estimates). The entire monument is listed on the National Register of Historic Places. The ruins are believed to be representative of the Sinagua, Anasazi, Cohonina, and Hohokam cultures. At Wupatki, a blowhole near the western boundary is still used today by local Navajo and Hopi medicinemen. Numerous additional sites are found on FS land southwest of the monument. Some of the more impressive sites in Wupatki are listed below (see Existing Conditions map for locations).

The Wupatki ruin, largest site in the monument, stands three stories high and contains nearly 100 rooms. A ceremonial amphitheater and a masonry ball court are a part of the ruin complex. The latter was a place for ceremonial games, probably similar to those in early Mexican cultures. Many fragile artifacts were uncovered in the excavation of this ruin.

The Citadel ruin contains from 30 to 50 rooms built on a lava mesa near a limestone sink. This ruin shows evidence of use for defense.

The Nalakihi ruin is typical in form of many of the smaller ruins in the Citadel area. An unusual cremation burial and several jug-shaped earth ovens, some of which were used for burials, were found during the excavation of this site.

The Crack-in-Rock ruin is located in the northern portion of the monument and has yielded pottery strongly influenced by the Anasazi culture. A wealth of petroglyphs are found in the vicinity. Like Citadel, the ruin shows evidence of use for defense.

Wukoki is the best-preserved ruin in the monument. Situated in the Wupatki Basin, it contains a block of rooms two and one-half stories high and is visible for several miles.

The Heiser pithouses are northeast of Heiser Spring. The site consists of two pithouses, one kiva, and three aboveground masonry structures. This excavated site has been subjected to severe subsurface seepage and erosion caused by natural elements.

Antelope is a medium-sized ruin located between the Crack-in-Rock and Wupatki ruins.

Lomaki is a picturesque ruin located near a group of earthcracks in the Citadel area.

The Park Service initiated a comprehensive archeological survey of Wupatki in 1981. The survey will be completed in 1986.

#### EXISTING DEVELOPMENT

As shown on the Existing Conditions map, access to the parks is by the main park road, which passes through and connects the two monuments. A scenic pullout approximately 1½ miles west of Sunset Crater provides orientation information for the areas. A visitor center, maintenance area,

and housing area are located near the boundary of Sunset Crater on land administered by the Forest Service. All the facilities described above were constructed and are operated and maintained by the Park Service under a cooperative agreement with the Forest Service. In 1967, a 44-unit campground was constructed by the Forest Service across from the visitor center. It is now operated by the Park Service under the cooperative agreement. The Lava Flow viewpoint is located 1¼ miles east of the visitor center.

Development at the Sunset Crater base area includes a 90-car parking area, a temporary contact station, and a 0.7-mile interpretive trail. The main park road passes through the parking area, creating a safety hazard. Prior to 1974 visitors were allowed to climb the crater from this location; however, because of severe erosion problems, visitors are no longer allowed access to the crater rim.

Near the eastern boundary of Sunset Crater, the Cinder Hills overlook, a small circle at the end of a spur road, offers a view of numerous cinder cones in the area. The site does not provide organized parking, which results in occasional congestion. About 3.5 miles east of Sunset Crater is the Painted Desert vista, a small picnic area constructed by the Forest Service but operated by the Park Service under the cooperative agreement.

The major visitor facility development at Wupatki is the visitor center near the Wupatki ruin. The headquarters for both monuments is also located in this building. Other administrative facilities in this area are a maintenance building and NPS housing. A new maintenance and housing area has been established east of Heiser Spring. The maintenance area is fenced, but a building has not yet been constructed. Housing currently consists of seven mobile homes and one modular/prefab structure. The former maintenance area at Heiser Spring is being phased out. The Doney picnic area near Wupatki is maintained by the Park Service under the agreement with the Forest Service.

Pullout parking areas provide visitor access to the Heiser pithouses and the Citadel ruin. Dirt roads provide access to small informal dirt parking areas immediately adjacent to the Wukoki and Lomaki ruins.

#### VISITOR USE AND INTERPRETATION

While the visitor experience at Sunset Crater and Wupatki national monuments is somewhat separate for each monument, the volcanic eruption of Sunset Crater links the two areas by a common thread. Visitor facilities at each monument are basically adequate. Both Wupatki and Sunset Crater have visitor centers that were constructed in the 1960s. The Sunset visitor center has new exhibit installations, and new exhibits will be designed for Wupatki in the next few years.

At Sunset Crater, the volcanic story is emphasized through interpretive media in the visitor center, where geological exhibits and audiovisuals introduce the broad concepts. At the base of Sunset Crater, a contact station provides general information in the summer and is the start of a

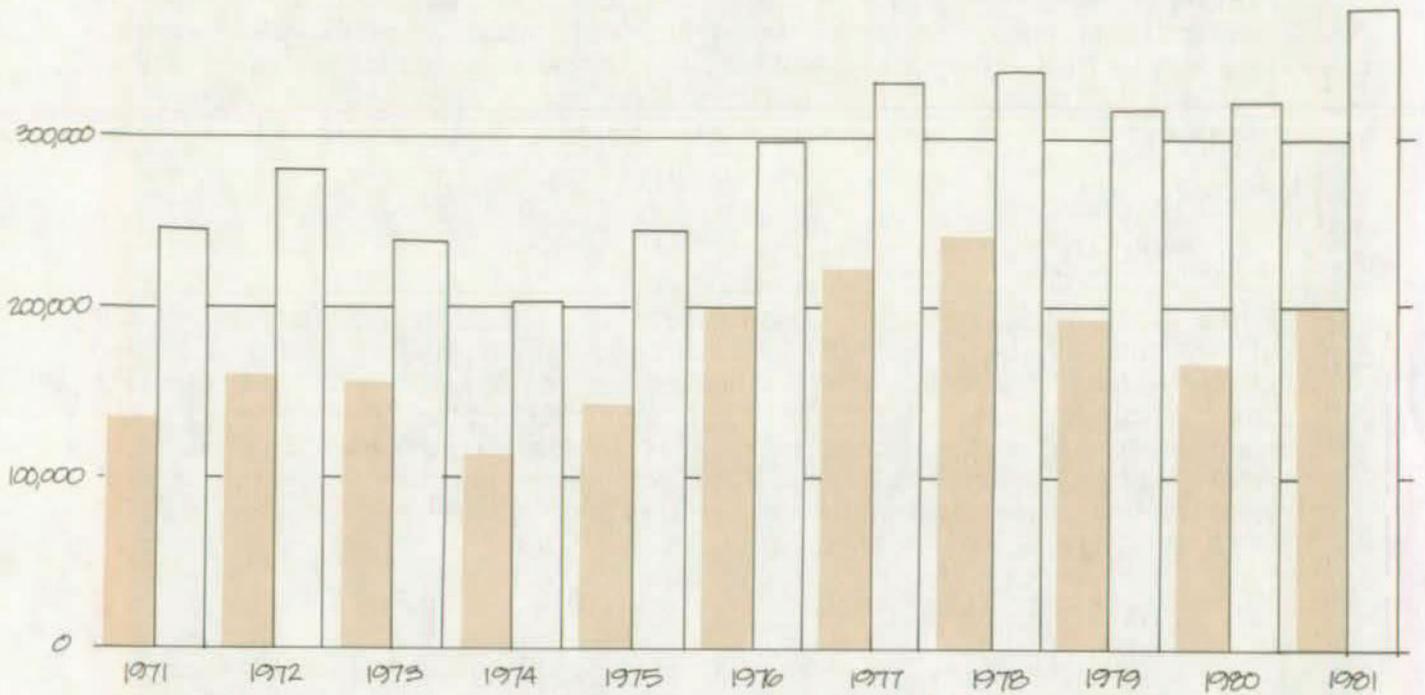
self-guiding nature trail below the crater. Nearby is an ice cave and a 2-mile trail connecting the area to the Bonito campground. Since visitors are prohibited from climbing up the crater, the park recently instituted a bus program to shuttle people to the top of O'Leary Peak for a view of the entire crater and the surrounding volcanic landscape; however, because of a lack of funds the shuttle was discontinued in 1982. This service may be reinstated in the future if funds become available. Campfire programs are offered at the Bonito campground, along with a number of other interpretive programs for visitors. Wayside exhibits at appropriate pullouts have been installed along the scenic drive through the monument. The road leads to Wupatki National Monument, where visitors may see the ruins of an extensive prehistoric occupation.

The Wupatki ruin is adjacent to the visitor center and is accessible via a self-guided trail. Numerous other prehistoric ruins are located in the monument, and representative examples may be reached by automobile. Prehistory is the central interpretive theme of the visitor center and of the area in general. Popular attractions along the main park road are the Wukoki, Citadel, Nalakihi, and Lomaki ruins. Interpretive programs are offered at the monument during the summer. During the spring and fall, organized backpacking trips are offered to the Crack-in-Rock ruin.

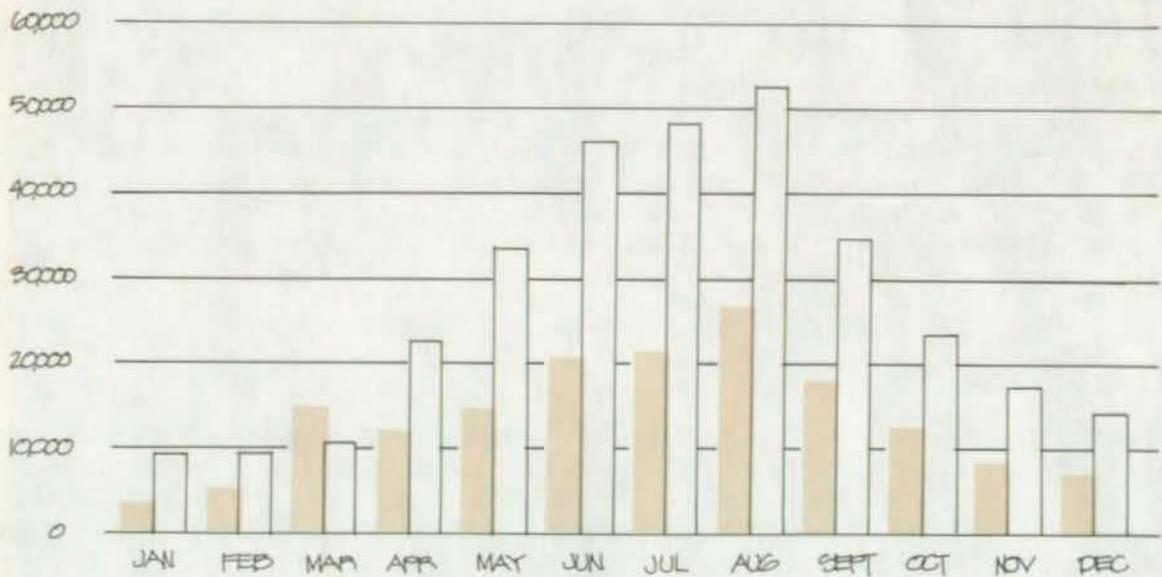
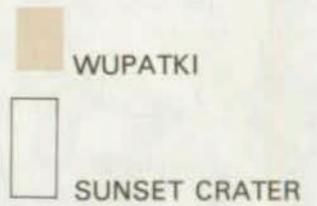
Travel to Sunset Crater and Wupatki is usually part of a broader itinerary that may include other archeological sites in the area or a visit to the Grand Canyon. Thus, time available at the monuments is usually limited, and most visitors experience only those resources readily accessible from the park road. Some confusion is experienced by visitors arriving at Wupatki from Sunset Crater. Without sufficient orientation, visitors assume that the first ruin they come to (Wukoki) is the only park resource, so they do not allocate enough of their limited time to experience the other features.

In 1980, annual visitation at Sunset Crater numbered 322,270, which was about the same as for 1979 (see Wupatki and Sunset Crater Visitation graph). At Wupatki, 166,898 visits were recorded for a 13 percent decrease from the previous year. However, in 1981, visitation at both monuments increased about 14 percent above 1980 counts to 364,006 at Sunset Crater and 189,979 at Wupatki. By comparison, visitation to the National Park System increased nationwide in 1981 by about 8 percent over 1980 counts. Nonrecreation visits account for less than 5 percent of the visitation of Wupatki and Sunset Crater.

# WUPATKI AND SUNSET CRATER VISITATION



ANNUAL VISITATION



1980 MONTHLY VISITATION

## THE PLAN

The Park Service will preserve and protect the natural and cultural resources of the monuments, provide for visitor use through interpretation and information services, and restore and improve existing facilities. NPS management will be in accordance with the numerous laws, regulations, policies, and guidelines affecting the monuments. The Park Service will continue to work with adjacent land managers to promote mutual objectives.

### LAND USE MANAGEMENT

Since all of Wupatki National Monument is listed on the National Register of Historic Places, it will be managed as a historic zone for the preservation, protection, and interpretation of the cultural resources and their settings. Sunset Crater National Monument will be managed as a natural zone for the conservation of natural resources and processes. Areas identified for visitor facilities and park operations on the General Development Plan map will be managed as park development zones.

### NATURAL RESOURCE MANAGEMENT

Under the "Natural Resource Management" and "Cultural Resource Management" sections, management strategies for the monuments are presented in priority order.

#### Grazing (1)

To allow for phasing out operations, the twenty-year grazing permit held by the CO Bar Cattle Company will be extended for five years after it expires in April 1983. The new permit will allow 600 animals to graze during the period of October 15 to March 15 of each year on approximately 16,000 acres in the western half of Wupatki National Monument. Following the five-year extension, the permit will not be renewed. To control livestock access to the park, unfenced portions of the Wupatki boundary will be surveyed and the fence completed. Based on traditional use, two Navajo families were given ten-year renewable grazing permits in October 1980. The permits expire with the death of the permittees and cannot be passed on to other members of the families.

#### Backcountry Use (2)

Since the backcountry visitation at Wupatki and Sunset Crater is very limited, no special controls will be established at this time to manage use. The guided hikes to the Crack-in-Rock ruin will be continued and expanded if there is sufficient demand and staffing levels permit. Trails and other areas of use will continue to be monitored for visitor impacts. A backcountry management plan will be prepared for the monuments when additional information becomes available on park resources, use, and impacts.

### Water Rights (3)

In order to comply with the NPS "Water Resources and Water Rights" management policy, a survey of federal surface and groundwater rights will be conducted at the monuments.

### Exotic Plants (4)

The eastern boundary of Wupatki along the Little Colorado River is heavily infested with hundreds of acres of tamarisk. Efforts will be made to prevent the species from spreading further, with eventual control along the river if feasible. Camelthorn, another exotic species, is present in association with tamarisk and has been observed to be grazed by native and domestic animals, which adds to the species dispersal. Cutting and spraying the plants with approved herbicides has been documented to be an effective control against camelthorn. Areas containing the plants will be delineated and treated. Russian thistle is also well established in Wupatki. Since the plant is considered to be a "naturalized species" that poses no serious threat to the environment, eradication efforts are not deemed to be necessary. However, accumulations of dead plants along fence rows may be burned occasionally.

### Air Pollution (5)

Industrial and commercial operations outside the monuments produce emissions that affect visibility at the parks and may adversely impact resources. Air quality monitoring will continue to determine exact sources of pollutants and their effects on natural and cultural resources. When sources and effects are better understood, efforts will be made to mitigate adverse impacts.

### Vegetation Analysis (6)

The impacts of grazing in Wupatki will continue to be monitored to determine the effects on soils, rare species, exotic dispersal, plant growth, range conditions, and cultural resources.

Juniper monosperma will be studied to determine if it is spreading in the monument and if fire should be used for control and range maintenance. Other plant communities will be monitored for changes in species composition and health.

### Endangered Species (7)

While there are no plants or animals known to exist in the monuments that are listed or proposed for listing by the Fish and Wildlife Service, there are several "category one" plant species existing or likely to exist in Wupatki. In addition, there are plants in the monuments listed by the Arizona heritage program. Efforts will be made to protect these species by locating, monitoring, and minimizing impacts on them, where practicable.

### Hazardous Tree Removal (8)

Trees in park development zones adjacent to roads and visitor use areas that are a hazard due to insect infestation, poor soils, and high winds will be identified and removed.

### Insect Infestation (9)

Additional research will be done to better understand this naturally occurring phenomenon.

### Landscape Plantings (10)

The elms in developed areas will be removed and replaced with more suitable species. A drip irrigation system will be installed to conserve water and maintain the plantings.

### Antelope Population Dynamics (11)

Historic antelope populations are thought to have been larger than at present. Range and habitat conditions will be studied to help preserve and enhance the resident herd of pronghorn. Other animal species will also be monitored to determine changes in population levels and habitat conditions.

### Abandoned Roads (12)

A study of the restoration potential for abandoned roads and borrow pits will be made to determine feasible alternative restorative techniques. Where feasible, disturbed areas will be restored to near natural conditions.

## CULTURAL RESOURCE MANAGEMENT

### Cultural Resources Survey (1)

The comprehensive five-year survey of Wupatki begun in the spring of 1981 should be completed as scheduled. The survey will provide needed information on site locations, prehistoric and historic. This information will enhance protection and interpretive efforts at the park and provide direction for future management actions.

### Preservation of Ruins (2)

Although Wupatki National Monument may contain over 2,500 archeological sites, it is not possible to preserve and stabilize all of the ruins. Priority will be given to culturally significant sites subject to the greatest visitor use. Most of the unexcavated ruins are in a self-stabilized

condition. A cultural resources preservation guide will be prepared to prescribe preservation techniques and priorities. The Heiser pithouses will be backfilled due to the immediate subsurface erosion and underground seepage problems and the shortage of stabilization funds.

#### Museum Collections (3)

Wupatki artifacts are found at the park, at the Museum of Northern Arizona in Flagstaff, and at the Western Archeological Center in Tucson. A master inventory of Wupatki artifacts will be done, using uniform catalogue standards. Park staff will be trained in museum collection procedures, and a collection preservation guide will be prepared for the monument.

#### Ethnographic Studies (4)

Information regarding the physical and spiritual significance of the monuments to the Hopi and Navajo peoples will be obtained by qualified ethnologists.

#### Administrative History of Wupatki (5)

A researched history of the monuments will be prepared to document land acquisition, permittee operation, archeological work, and earlier occupation and use of the area by modern Indians and European man.

#### Analysis of Ball Court Artifacts (6)

The Wupatki ball court was excavated in 1965, but the artifacts removed were never analyzed. To support interpretation of this popular feature, precise information on the artifacts is needed.

#### Investigation of Paleoenvironmental Conditions (7)

Research on the conditions of Wupatki during the Sinaguan occupation will provide a better understanding of the environment in which these peoples existed.

Archeologists are beginning to change their thinking about the relationship between the vulcanism of Sunset Crater and the Sinaguan occupation of the Wupatki area. Climatic changes and population migrations were occurring throughout the Southwest and probably had as much or more to do with the influx of people to the Flagstaff area as did the ash deposits from local vulcanism.

### Burial Study (8)

Modern research techniques should be applied to burials removed from Wupatki in the 1930s to provide information on physiological conditions and disorders that may provide insight into the inhabitants, why the area was abandoned, and population trends in the Wupatki Basin.

### Renovation of Wupatki Spring (9)

The spring will be located and the flow reestablished to enhance interpretation of the ruins and to provide a natural water source for wildlife.

## VISITOR USE AND INTERPRETATION

The theme at Wupatki is the original inhabitants and native villages of the Southwest. The theme at Sunset Crater is the works of volcanism in the Colorado Plateau. The plan proposes methods to interrelate the stories of both monuments so that visitors will enjoy a cohesive experience.

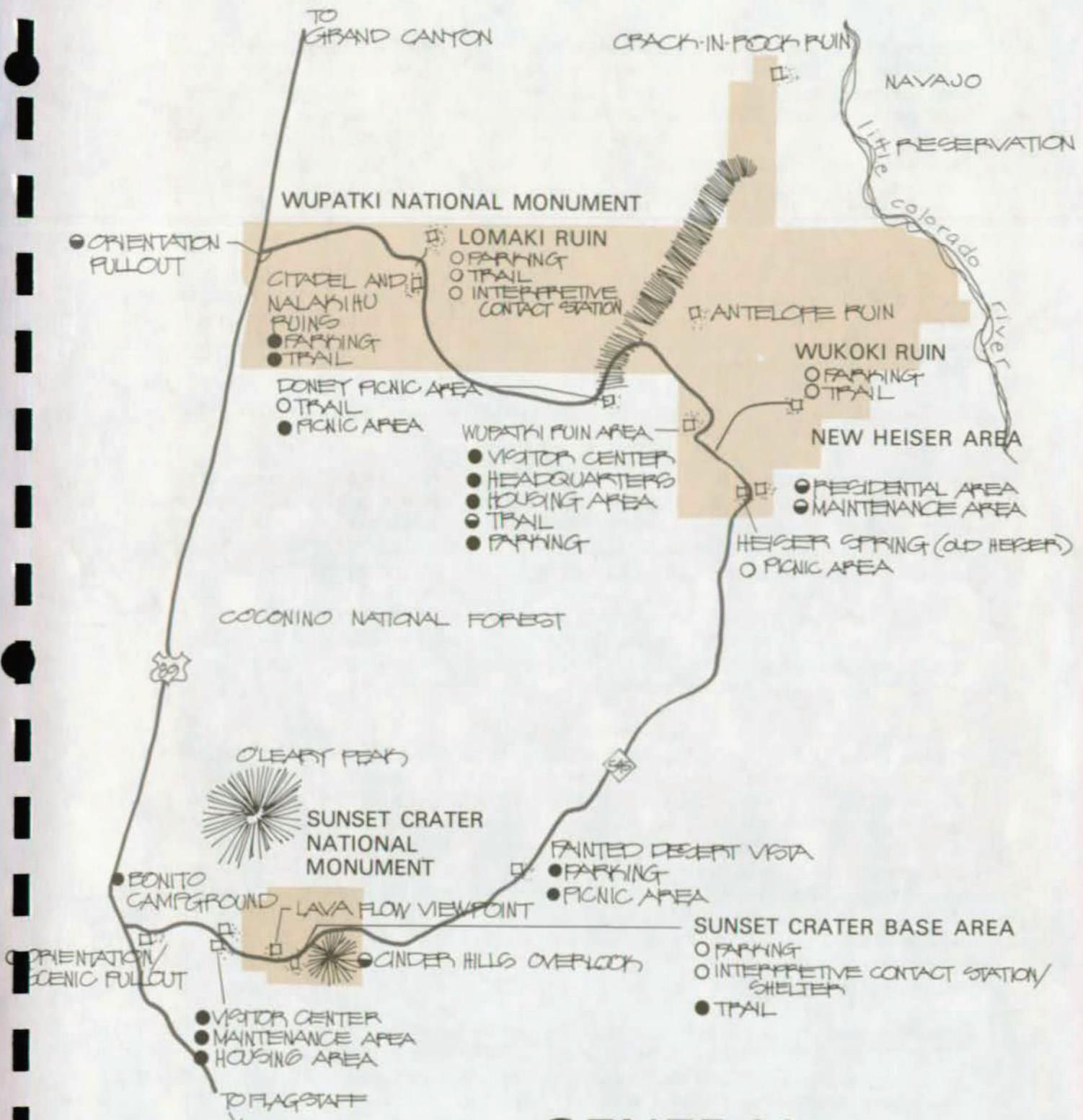
A new interpretive prospectus will be undertaken as soon as data from the archeological survey and ethnohistorical study becomes available. The interpretive prospectus will address interpretive services, handouts, audiovisual presentations, exhibits, and interpretive trails in detail. No significant expenditure of funds on new interpretive programs will be made until the archeological survey and new interpretive prospectus are completed.

Wupatki and Sunset Crater represent parts of the same regional story, and interpretation at both monuments should reflect this. Walnut Canyon National Monument also contributes to the story and should be included, at least by reference, in visitor orientation to the region.

### Proposed Interpretation and Visitor Facilities

The primary visitor experience will continue to be interpretive stops on the main park road through the monuments. Improved visitor facilities along the way will provide for appropriate use of the areas. Main park road improvements will be made at both monuments. Priority work will include (1) reconstruction of the section through Sunset Crater, including guardrails where needed and realignment of a curve northeast of the crater; (2) resurfacing a section between the FS boundary and Wupatki; and (3) resurfacing a section near the Citadel ruin. The entire road through the monuments will eventually be resurfaced or reconstructed as needed to provide a safe, attractive, and low maintenance surface. Entrance signs will be installed at Sunset Crater and upgraded at Wupatki.

To assist visitors in planning their time and getting the most out of their visit, orientation information will be provided at the north and south intersections of the main park road with U.S. 89. A new pullout will be



● ORIENTATION  
FULLOUT

WUPATKI NATIONAL MONUMENT

CITADEL AND  
NALAKI HU  
RUINS  
● PARKING  
● TRAIL

DONEY PICNIC AREA  
○ TRAIL  
● PICNIC AREA

LOMAKI RUIN  
○ PARKING  
○ TRAIL  
○ INTERPRETIVE  
CONTACT STATION

WUPATKI RUIN AREA  
● VISITOR CENTER  
● HEADQUARTERS  
● HOUSING AREA  
● TRAIL  
● PARKING

ANTELOPE RUIN

WUKOKI RUIN  
○ PARKING  
○ TRAIL

NEW HEISER AREA

● RESIDENTIAL AREA  
● MAINTENANCE AREA

HEISER SPRING (OLD HEISER)  
○ PICNIC AREA

COCONINO NATIONAL FOREST

O'LEARY PEAKS



SUNSET CRATER  
NATIONAL  
MONUMENT

PAINTED DESERT VISTA  
● PARKING  
● PICNIC AREA

BONITO  
CAMPGROUND

LAVA FLOW VIEWPOINT

SUNSET CRATER BASE AREA  
○ PARKING  
○ INTERPRETIVE CONTACT STATION/  
SHELTER  
● TRAIL

ORIENTATION/  
SCENIC FULLOUT

CINDER HILLS OVERLOOK

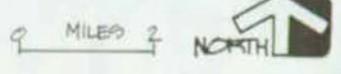
● VISITOR CENTER  
● MAINTENANCE AREA  
● HOUSING AREA

TO FLAGSTAFF  
↓

- LEGEND
- EXISTING
  - PROPOSED
  - UPGRADE
  - PAVED ROAD

# GENERAL DEVELOPMENT PLAN

WUPATKI AND SUNSET CRATER  
NATIONAL MONUMENTS/ ARIZONA  
UNITED STATES DEPARTMENT OF THE INTERIOR  
NATIONAL PARK SERVICE 322 | 20008B  
DSC | SEPT 82



ON MICROFILM

developed at the south intersection, and the existing pullout will be improved at the north intersection. At both sites, orientation maps will show locations of and mileages between facilities and points of interest. The significance of the monuments and their relationship will be briefly introduced. (See the General Development Plan for all proposed facilities.)

Sunset Crater. The existing pullout about  $\frac{1}{2}$  mile east of the south intersection will be phased out, and a new scenic pullout will be established in a more visually appropriate site at Bonito Park (approximately 0.4 mile west of the Sunset Crater visitor center). From this pullout visitors have a dramatic view of Sunset Crater and the San Francisco Peaks. Interpretation will provide a geological overview of the volcanic field and will explain the relationship between Sunset Crater and the San Francisco Peaks.

A trailer dump station will be provided at the campground near the Sunset Crater visitor center.

Existing interpretation at the visitor center introduces basic processes of vulcanism. Future planning for the visitor center might explore ways to offer additional content relating the volcanic processes to the features at Sunset Crater and briefly discuss the relationship of local vulcanism to human occupation at Sunset Crater, Wupatki, and Walnut Canyon.

An interpretive wayside at the Lava Flow viewpoint will explain the nature of its flow, extent, and relationship to Sunset Crater. A message about the importance of not collecting rocks and other resources in the monument will also be included.

The existing Sunset Crater base area parking lot will be obliterated and replaced by a new parking area approximately  $\frac{1}{4}$  mile west. This will be a safer location and provide better views of Sunset Crater while not encouraging illegal and destructive scrambling onto the crater. A short spur trail will be constructed to connect the new parking area with the existing interpretive trail. A small contact station/shelter (with restrooms) will be developed at the new area and function as an attended and/or unattended interpretive station (depending on staffing and use levels). Interpretation will detail the formation of Sunset Crater, relating it back to the San Francisco Peaks. The influence of Sunset Crater's eruptions on the inhabitants of the area and the later inhabitants of the Wupatki area will be discussed.

The Cinder Hills overlook will be redesigned to provide for a small number of organized parking spaces. The site will include interpretation of the geological features, such as volcanic craters and the fault lines along which they are concentrated.

Interpretation at the Painted Desert vista will include an explanation of the vegetation zones that visitors will encounter along the road as they descend from Sunset Crater to Wupatki.

Wupatki. Signing at the Wukoki road intersection in Wupatki will be improved to clearly identify the location of the Wupatki visitor center, as well as the Wukoki ruin. To reduce the existing impact of facilities at Wukoki, the parking area will be relocated away from the ruin southeast of the existing area, and the access road and new parking area will be paved. The old access and parking area will be obliterated. The plant species Ansonia peeblesii will be preserved in this area to the maximum extent practicable.

Exhibits at the Wupatki visitor center will be reworked or replaced based on a new interpretive prospectus. All trail brochures will be reevaluated and updated commensurate with new information. The Wupatki ruin trail will be redesigned and upgraded for handicap accessibility to the maximum extent practicable.

For visitors arriving at Wupatki from the north, a small contact station/shelter (with restrooms) will be developed at the Lomaki ruin road intersection. This facility will orient visitors to the features of the area and will locate the visitor center. An overview of the interpretive story may be offered at this facility, including some explanation of the unique geological features at Wupatki. The station will function with or without staffing, as needed. The Lomaki ruin road will be paved to a new hard-surfaced parking area relocated away from the ruin. The remainder of the road from the parking area to the ruin will be reduced to a trail, and the old parking area will be obliterated.

New toilets and a short trail will be provided at the Doney picnic area. A new picnic facility will be developed at the Heiser Spring area, following removal of the obsolete (1940s) maintenance structure and general rehabilitation of the site.

## PARK OPERATIONS

### Administrative Headquarters

Since there is a greater land base at Wupatki National Monument, existing office space and housing, a major maintenance function, and the operation is already well established, the administrative headquarters for the two monuments will remain in the visitor center building near the Wupatki ruin.

### Forest Service Lands

Areas operated under the cooperative agreement will continue to be managed jointly with the Forest Service. This arrangement, while requiring coordination and administrative effort, is working, and additional efforts will be made to support this cooperation. Therefore, at this time, a proposal will not be made by the Park Service to expand the monument boundaries or transfer any lands in Coconino National Forest to NPS administration.

## Energy Conservation

Detailed evaluations will be made of administrative and visitor facilities to determine what, if any, retrofitting techniques will be employed to conserve energy. Techniques may include passive and active solar, insulation, and other modifications that are deemed to be practicable and cost-effective. All new structures will be designed to conserve energy.

## Park Service Housing

Some housing is required at Sunset Crater for campground operations and snow removal. The housing area behind the Sunset Crater visitor center (six units) will be improved, but the three temporary structures (mobile homes) will not be replaced with permanent housing because of their proximity to Flagstaff and the OMB housing policy. Improvements will include garage/ storage units, ramadas for the mobile homes, and small yards if practicable. Facilities will be screened from the park road as much as possible.

The nearest available housing to Wupatki National Monument is in Flagstaff, more than 40 miles away; therefore, the three family units and the four-unit apartment building near the visitor center will be maintained. A temporary retaining wall behind the apartment building will be replaced with a permanent wall. At New Heiser, the temporary quarters (nine units) will be replaced with an equivalent number of permanent quarters (in a combination of family units and apartments) when funds become available. In the interim, improvements will be made to the existing quarters, including ramadas, garage/storage units, and small yards if practicable. The road and driveways will also be hard surfaced at New Heiser to reduce dust and maintenance problems.

## Maintenance

The existing maintenance facility at Sunset Crater will be maintained in its present location behind the visitor center. At Wupatki, a maintenance building will be constructed in the New Heiser area to replace outmoded facilities at Old Heiser and the Wupatki ruin area. Following construction of the new building, the existing maintenance building (built in the 1960s) at the Wupatki ruin area will be converted to a ranger workshop/storage building.

## Staffing Levels and Costs

Over the next ten to fifteen years, if funds become available, the existing staff of eleven full-time and three seasonals stationed at Wupatki and five full-time and one seasonal at Sunset Crater will be increased to sixteen full-time and thirteen seasonals at Wupatki and six full-time and six seasonals at Sunset Crater (see table 1). The annual operating budget for the monuments will increase from the current FY 1982 total of \$384,000 to a total of \$672,000. This will allow for an optimum level of visitor services and protection of park resources. A significant portion of this increase will be devoted to urgently needed ruin stabilization efforts and road work.

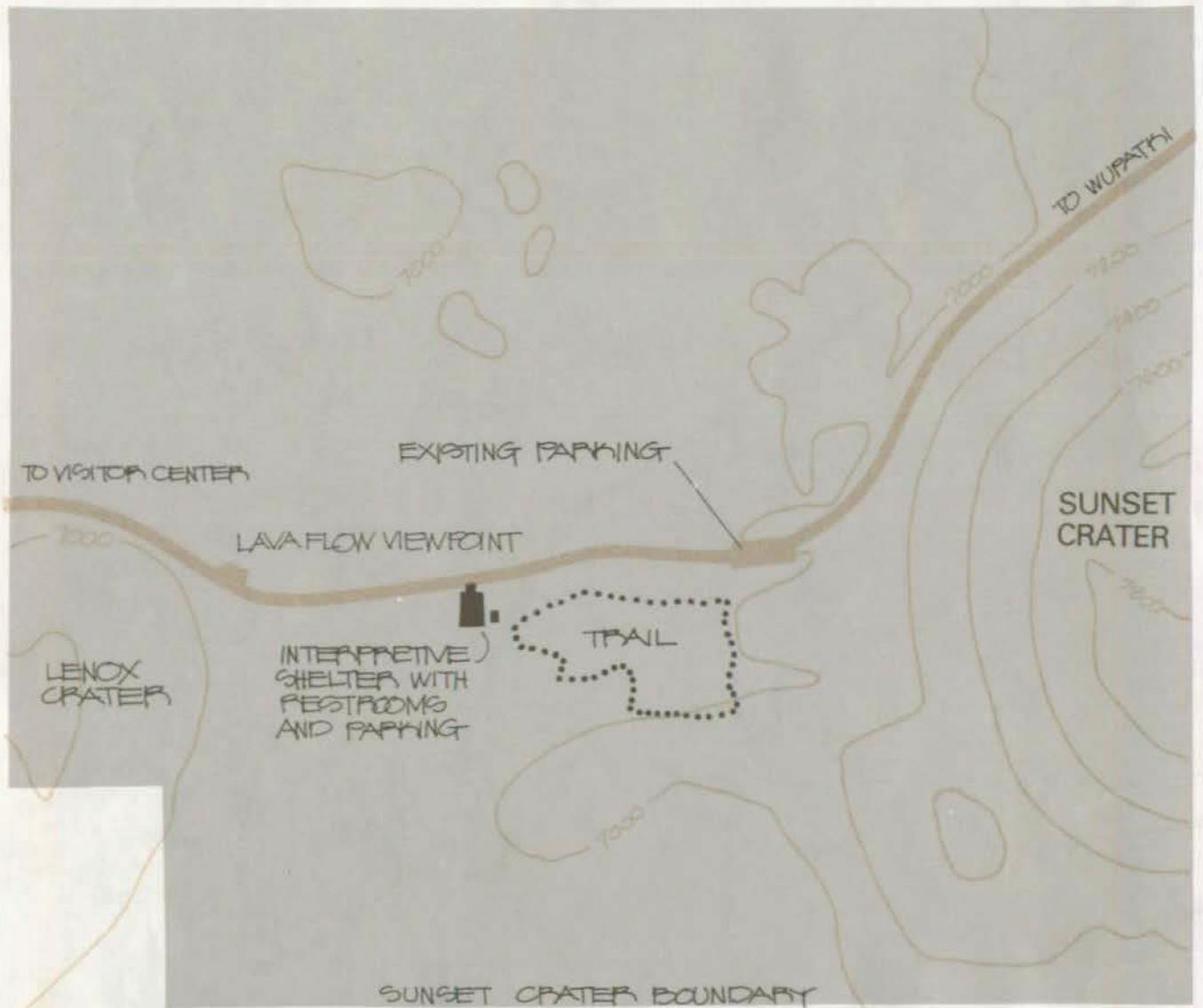
Table 1: Proposed Staffing  
Wupatki and Sunset Crater National Monuments

		<u>Permanent Work Years</u>	<u>Seasonal Work Years</u>
Administration			
Wupatki			
	Superintendent GS-12	1	
	Budget clerk GS-7	1	
	Clerk/typist GS-4	<u>1</u>	
		3	
Interpretation and Resource Management			
Wupatki			
	Chief, I & RM GS-11	1	
	Res. mgmt. spec. GS-9	1	
	Supv., park rgr. GS-9	1	
	Park ranger (archeologist) GS-7	1	
	Park ranger (museum curator) GS-5	1	
	Park ranger GS-4	1	
	Park rangers (4) GS-4	<u>        </u>	<u>1.9</u>
		6	1.9
Sunset Crater			
	Supv., park rgr. GS-9	1	
	Park ranger GS-7	1	
	Park ranger GS-5	1	
	Park ranger GS-4	1	
	Park rangers (4) GS-4	<u>        </u>	<u>2.1</u>
		4	2.1
Maintenance			
Wupatki			
	Chief, park maint. WS-8	1	
	Work leader WL-8	1	
	Equip. op. (roads) WG-10	1	
	Maint. worker (roads) WG-7	1	
	Maint. worker (B & U) WG-8	1	
	Maint. worker (ruins) WG-8	1	

		<u>Permanent Work Years</u>	<u>Seasonal Work Years</u>
	Maint. worker (B & U) WG-5	1	
	Laborers (4) (ruins) WG-5		1.6
	Laborer (visitor center) WG-5		0.35
	Laborer (roads) WG-4		0.35
	Painter WG-7		0.5
	Laborers (2) WG-4	—	<u>0.7</u>
		7	3.5
Sunset Crater	Maint. worker WG-8	1	
	Maint. worker WG-5	1	
	Laborer WG-5		0.5
	Laborer WG-4	—	<u>0.5</u>
		2	<u>1.0</u>
		—	—
	Grand Total	22	8.5

DEVELOPMENT CONCEPTS

The plan proposes a 10 to 15 year restoration and improvement strategy for the monuments. The proposals call for replacement and rehabilitation of existing facilities in most cases, with the development of new facilities in only a few minor instances. Facilities will be replaced or improved with minimum impacts on park resources and will be harmonious with the area and its resource in proportion, color, and texture. The Park Service will comply with all applicable safety and environmental laws, executive orders, and regulations. Contract documents will specify minimum practicable vegetation, soil disturbance, and air, water, and noise pollution during construction. Utility lines will be placed underground following road corridors, and landscape plant materials will be restricted to nonaggressive species compatible to the area. Accessibility for handicapped persons in new and rehabilitated facilities will be provided to the maximum extent practicable. New facilities will use all practicable means of energy conservation emphasizing passive solar techniques and active systems if cost-effective. Buildings will be oriented to take advantage of solar heating in the winter and designed to maximize natural cooling in the summer. Adequate insulation will be installed and other energy conservation techniques employed where feasible.

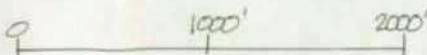


COCONINO NATIONAL FOREST

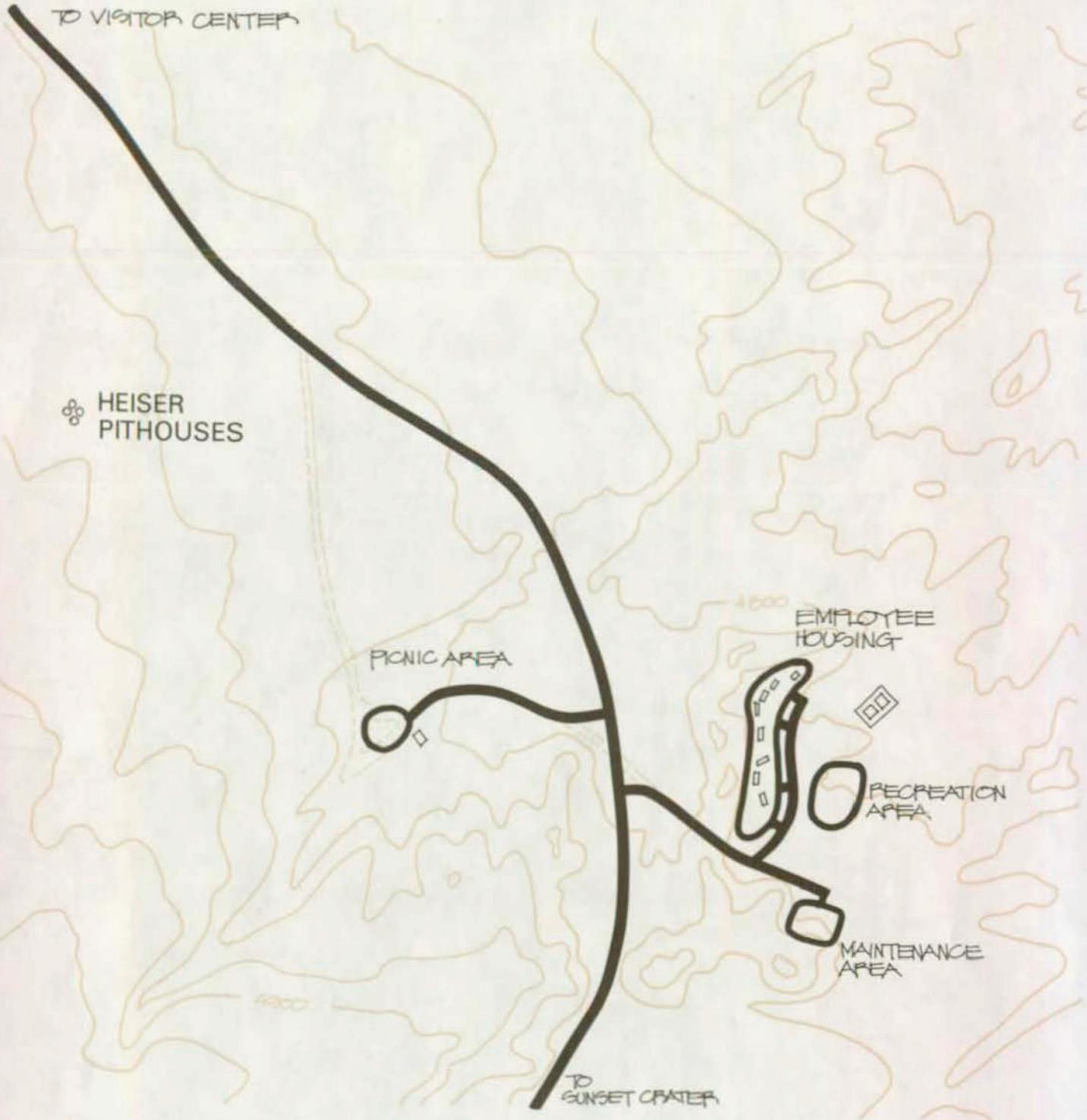
SUNSET CRATER BASE AREA  
**DEVELOPMENT  
 CONCEPT**

WUPATKI AND SUNSET CRATER,  
 NATIONAL MONUMENTS, ARIZONA  
 UNITED STATES DEPARTMENT OF THE INTERIOR/  
 NATIONAL PARK SERVICE

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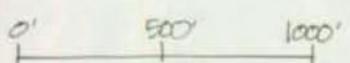


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HEISER AREA  
**DEVELOPMENT  
 CONCEPT**

WUPATKI AND SUNSET CRATER,  
 NATIONAL MONUMENTS/ARIZONA  
 UNITED STATES DEPARTMENT OF THE INTERIOR/  
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CW MICROFILM

WUKOKI RUIN

4000

TRAIL

PARKING

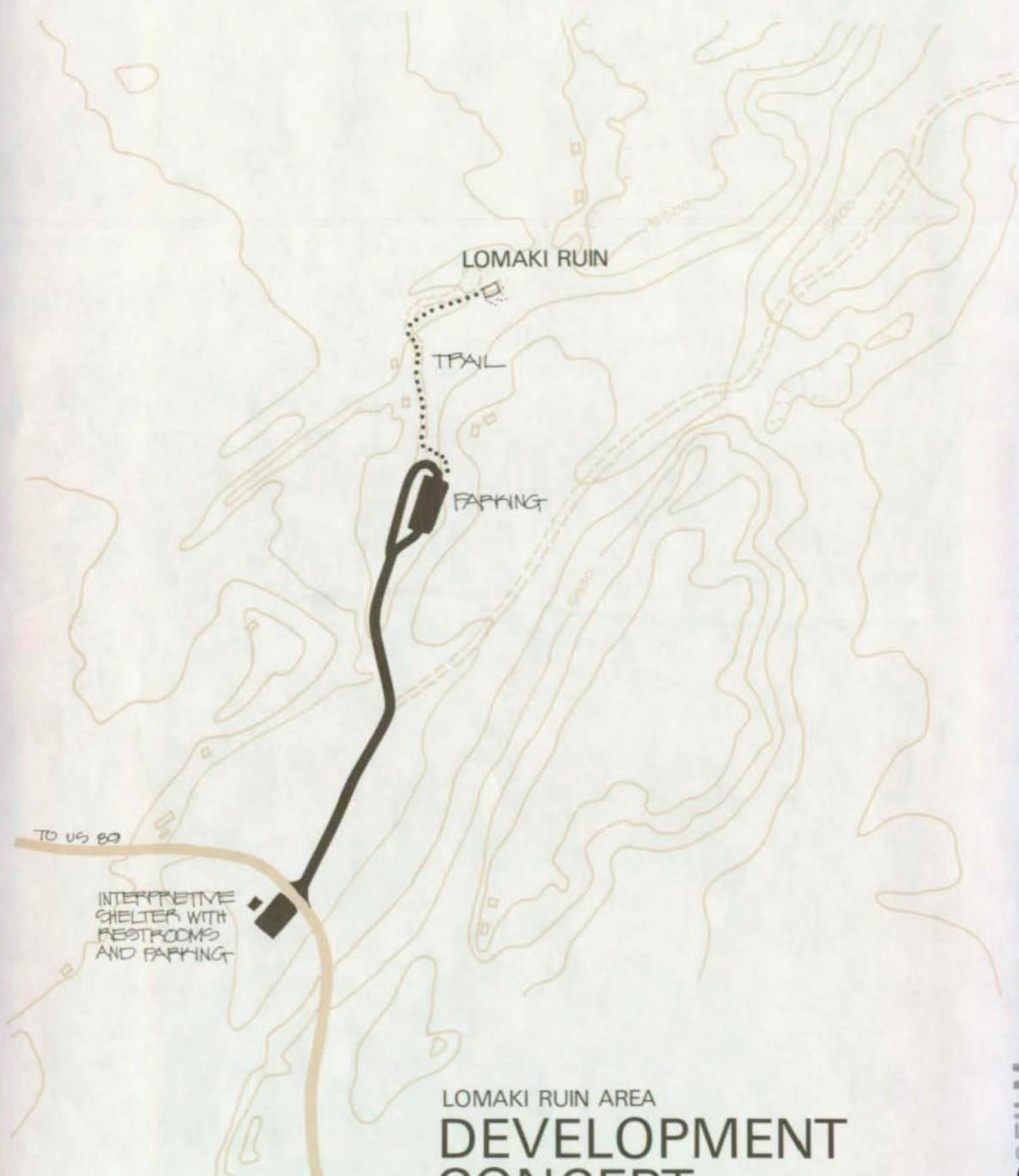
WUKOKI RUIN AREA  
**DEVELOPMENT  
CONCEPT**

WUPATKI AND SUNSET CRATER  
NATIONAL MONUMENTS/ ARIZONA  
UNITED STATES DEPARTMENT OF THE INTERIOR/  
NATIONAL PARK SERVICE



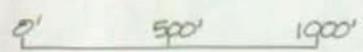
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ON MICROFILM



LOMAKI RUIN AREA  
**DEVELOPMENT  
 CONCEPT**

WUPATKI AND SUNSET CRATER  
 NATIONAL MONUMENTS/ ARIZONA  
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 NATIONAL PARK SERVICE 322 | 20015A  
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Table 2: Development Priorities and Costs (1982)

(1) Road Improvements	
Reconstruct and realign (7.5 miles)	\$1,500,000
Resurface (6 miles)	900,000
Construct Sunset Crater base parking (up to 50 car/5 bus)	70,000
Obliterate existing base parking (2,500 SY)	15,000
Provide Sunset Crater orientation pullout (3 car)	6,000
Establish Sunset Crater scenic pullout (4 car)	8,000
Redesign Cinder Hills overlook (5 car)	8,000
Improve existing orientation pullout at north entrance (3 car)	6,000
Provide striping and signing (37 miles)	<u>140,000</u>
Subtotal	\$2,653,000
(2) Lomaki and Wukoki Parking Areas and Roads	
Relocate Lomaki parking (16 car/2 bus)	\$ 30,000
Construct Lomaki trail (1,200 LF)	12,000
Relocate Wukoki parking (10 car/1 bus)	18,000
Construct Wukoki trail (800 LF)	8,000
Surface Lomaki road (0.5 mile)	100,000
Surface Wukoki road (2.5 miles)	<u>500,000</u>
Subtotal	\$ 668,000
(3) Wupatki Housing Improvements (Interim)	
Provide ramadas for mobile homes (9)	\$ 135,000
Surface roads and parking (8,800 SY)	88,000
Provide carports with storage units (10)	40,000
Construct privacy fencing (800 LF)	11,000
Install irrigation for lawns (4,000 SF)	6,000
Improve retaining wall at existing apartment building (240 LF)	<u>15,000</u>
Subtotal	\$ 295,000
(4) Sunset Crater Housing Improvements	
Provide ramadas for mobile homes (3)	\$ 45,000
Construct garage/storage structures (2 units of 3)	40,000
Provide privacy fencing (480 LF)	7,000
Install irrigation for lawns (2,400 SF)	<u>4,000</u>
Subtotal	\$ 96,000
(5) Boundary Fencing at Wupatki	
Install fencing (25 miles)	\$ 135,000
Provide cattle guards (8)	<u>80,000</u>
Subtotal	\$ 215,000

(6) Maintenance Building at Wupatki		
Construct New Heiser maintenance building (5,800 SF)		\$ 416,000
Convert existing maintenance building to office and workshop (680 SF)		27,000
Remove Old Heiser maintenance building		1,000
	Subtotal	<u>\$ 444,000</u>
(7) Interpretive Facilities		
Construct Sunset Crater base contact station/shelter w/restrooms (530 SF)		\$ 53,000
Construct Lomaki area contact station/shelter w/restrooms (270 SF)		27,000
Provide Lomoki parking (10 car/1 bus)		18,000
Rehabilitate Wupatki ruin trail for handicapped (0.5 mile)		15,000
	Subtotal	<u>\$ 113,000</u>
(8) Building Energy Conservation		
Retrofit Sunset Crater visitor center (2,000 SF)		\$ 20,000
Retrofit Sunset Crater maintenance building (680 SF)		7,000
Retrofit Wupatki visitor center/headquarters (3,500 SF)		35,000
Retrofit Wupatki residences (3)		21,000
Retrofit Wupatki apartments (4)		16,000
Retrofit Sunset residences (3)		21,000
	Subtotal	<u>\$ 120,000</u>
(9) Visitor Facilities Improvement		
Install Doney picnic area restrooms (waterless)		\$ 25,000
Construct Doney picnic area trail (0.5 mile)		15,000
Develop Old Heiser picnic area (10 sites)		8,000
Install Old Heiser restrooms (w/water)		60,000
Connect utilities at Old Heiser		14,000
Surface Old Heiser road (1,000 LF)		37,000
Provide trailer dump station at Bonito campground		25,000
	Subtotal	<u>\$ 184,000</u>
(10) New Heiser Housing Replacement		
Provide family type units (5)		\$ 425,000
Provide apartments (4)		120,000
	Subtotal	<u>\$ 545,000</u>
	Grand Total Net	\$5,333,000
	Grand Total Gross	\$7,786,000

NOTE: Gross costs include the addition of 46 percent of net costs for design, construction supervision, and contingencies.

## LAND PROTECTION

The outstanding mineral rights owned by the state of Arizona on 2,710 acres of land in Wupatki near U.S. 89 will be acquired through an exchange for equivalent federal mineral rights outside the monument. All other lands (including mineral rights) in the monuments are in federal ownership.

In the 1981 Environmental Assessment on the Draft General Management Plan, alternatives for boundary expansion were analyzed, which would have involved the transfer of adjacent FS-administered land to the Park Service in areas cooperatively managed or under investigation for geothermal development. Because the cooperative agreement is working effectively and because geothermal potential is highly speculative, the Park Service will not propose a change in monument boundaries at this time.

## STATUS OF LEGAL COMPLIANCE

### National Environmental Policy Act (Section 102)

On March 5, 1982, the regional director, National Park Service, approved a Finding of No Significant Impact (FONSI) for the General Management Plan based on review of the 1981 Environmental Assessment. Actions described in the FONSI may be carried out without further NEPA documentation.

### Endangered Species Act (Section 7)

On December 23, 1981, the acting regional director transmitted an informal biological assessment with a no-effect conclusion and a copy of the Environmental Assessment to the regional director, U.S. Fish and Wildlife Service in Albuquerque. Future implementing actions may proceed after it has been determined that no new species or information must be considered. Plant surveys may be needed.

### Floodplain and Wetland Management (Executive Orders 11988 and 11990)

There are no wetlands in the monuments, and there are no facilities existing or proposed to be located in a floodplain.

### National Historic Preservation Act (Section 106)

Pursuant to the programmatic memorandum of agreement, as amended, the Park Service has involved the Advisory Council on Historic Preservation and the state historic preservation officer in the development of the proposals by their review of planning documents. A copy of the FONSI was transmitted to the Advisory Council and preservation officer for a final opportunity to object to the proposals. There were no objections; therefore, implementing actions may be carried out with internal review

and certification according to NPS policies and procedures. Areas scheduled for development have been or will be surveyed for cultural resources prior to construction to ensure that no significant resources are affected.

American Indian Religious Freedom Act

The Navajo and Hopi peoples were consulted in the preparation of this plan, and no objections were raised to the proposals.

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### NORTHERN ARIZONA UNIVERSITY, DEPARTMENT OF BIOLOGICAL SCIENCES

1981 "Natural Resource Survey and Analysis." Final Report (Phase IV). Flagstaff, Arizona.

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1972 "General Soil Map: Coconino County, Arizona."

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1948 "Master Plan."

1971 "Wilderness Recommendation: Wupatki National Monument."

1974 "Master Plan (Draft)."

1975 "Interim Interpretive Prospectus."

1975 "Statement for Management."

1980 "Outline of Planning Requirements."

1980 "Statement for Interpretation."

1981 Proposal/ Environmental Assessment for the General Management Plan.

1981 "Resources Management Plan."

1982 "Finding of No Significant Impact."

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As the nation's principal conservation agency, the Department of the Interior has basic responsibilities to protect and conserve our land and water, energy and minerals, fish and wildlife, and parks and recreation areas, and to ensure the wise use of all these resources. The department also has major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.