

NATURAL AND CULTURAL RESOURCES MANAGEMENT PROGRAM

An Addendum to the Natural
And Cultural Resources Management Plan

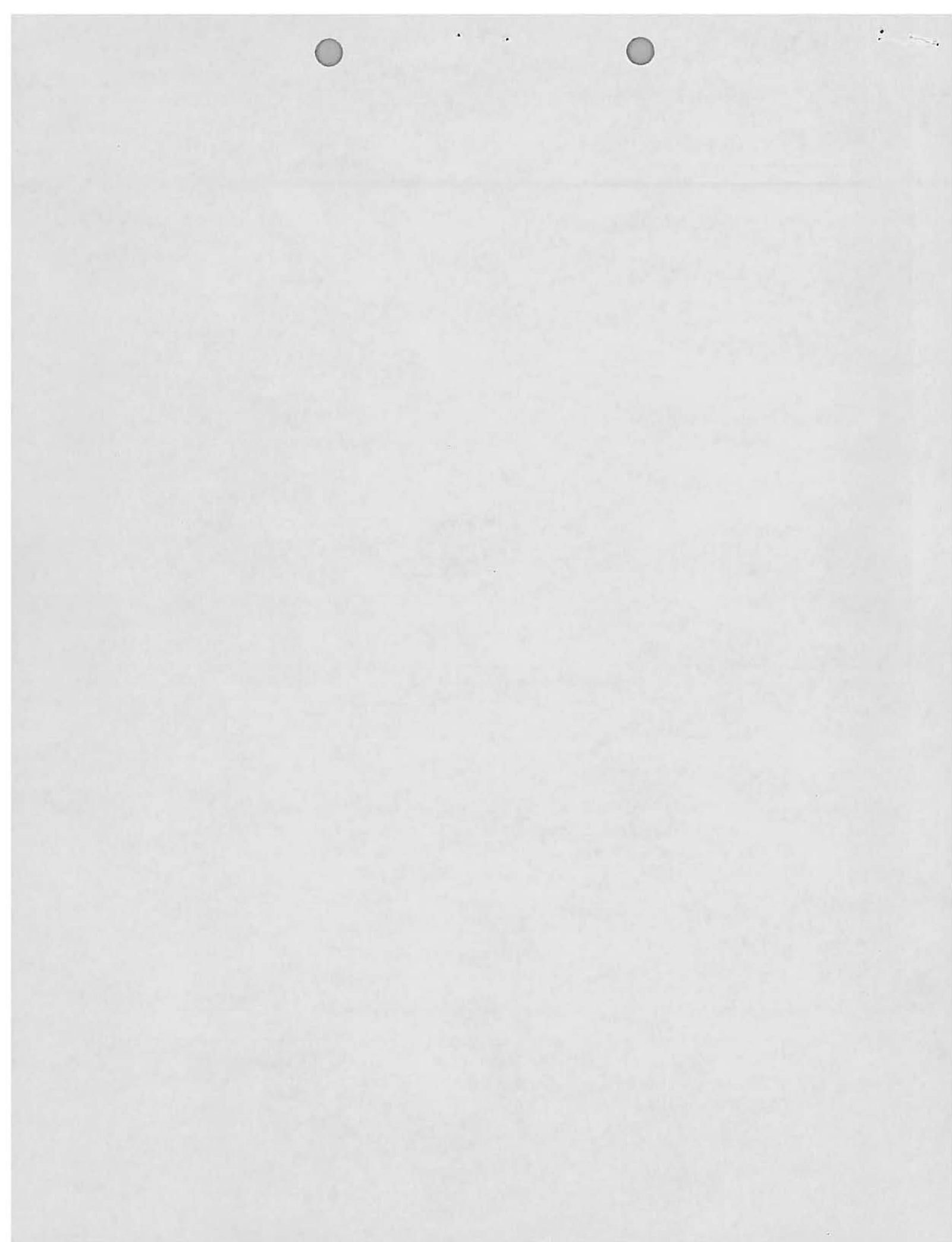
MONTEZUMA CASTLE

NATIONAL MONUMENT/Arizona

Prepared by
MONTEZUMA CASTLE NATIONAL MONUMENT

January 1984 Revision

National Park Service / U.S. Department of the Interior



MANAGEMENT PROGRAM

*An Addendum to the
NATURAL AND CULTURAL RESOURCES MANAGEMENT PLAN
FOR
MONTEZUMA CASTLE NATIONAL MONUMENT
ARIZONA*

*Prepared by
Montezuma Castle National Monument
National Park Service
Department of the Interior
Revision of January 1984*

NATURAL AND CULTURAL RESOURCES MANAGEMENT PROGRAM

OVERVIEW AND NEEDS

The Montezuma Castle Natural and Cultural Resources Management Plan and Environmental Assessment was completed in November 1975. That plan included an addendum, the Management Program. This edition represents a revision of the Management Program.

This reference document is used in carrying out resource projects at Montezuma Castle National Monument. While the Resources Management Plan proposes a long-term action program, this Management Program deals with the next five years only. The Program proposes projects for Fiscal years 1982 through 1986. As often as needed, generally annually, the Management Program will be revised and updated for a new five-year period as work is completed and new projects are proposed.

The Management Program presented on the subsequent pages of this document consists of:

1. Resources Projects Programming Sheet. This summarized each project's priority and proposed time schedule for a five-year period. This sheet indicates which project require additional funds from Western Regional Office to carry them out.
2. Formerly Proposed Resources Project Statement. These projects were included in the original Management Program but haven't yet been completed and some not yet started.
3. Air Quality General Statement.
4. Status of Resources Projects. A summary table of resources management actions underway and proposed.
5. Needs for Assessment of Cultural Resources. This statement reviews steps to be taken to assure proposed development projects will not damage cultural resources.
6. Maintenance Stabilization Program Summary Statement.

The Management Program does not contain project statements for basic research in Montezuma Well. We recognize the value of the Well as a research resource as documented by the November, 1982, report by Dr. Gerald A. Cole titled "The Uniqueness of the Montezuma Well-Ditch System as Research Resource." However, we do not believe the potential which exists for research will modify the management of Montezuma Well. We look on the ecosystem of the Well as being unique. Our management approach is essentially to protect it and let the natural system work. We will encourage researchers to study there so that we can obtain a better understanding of the resources, but do not believe a management problem exists which needs to be addressed in a project statement.

It was determined through public and National Park Service review of the 1975 Natural and Cultural Resource Management Plan, Environmental Assessment, and Management Program that the proposed actions would not have significant environmental impacts or adversely affect cultural resources. Because the newly proposed projects fall within the "umbrella" of the 1975 Environmental Assessment and Section 106 clearance, no further consultation and/or documentation of impacts is necessary prior to project implementation.

1/12/84
Date

Glen E. Henderson
Superintendent, Montezuma Castle National Monument

2/6/84
Date

Lawrence H. Chapman
Regional Director, Western Region

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RESOURCES MANAGEMENT PROGRAMMING SHEET

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MONTEZUMA CASTLE NATIONAL MONUMENT

WESTERN AZ
REGION STATE

January, 1984
Date

NATIONAL PARK SERVICE COSTS IN DOLLARS

MONUMENT PRIORITY	PROJECT TITLE	Action Type	YEAR 1		YEAR 2		YEAR 3		YEAR 4		YEAR 5	
			Base**	New***	Base	New	Base	New	Base	New	Base	New
1.	A-2 Stabilization** Castle Ruins	Mgmt.	500		500		500		500		500	
2.	N-2 Eradication/Control of Asiatic Clam	Research		Donated								
3.	W-1 Hydrological**** Studies	Research		1000		1000		1000		1000		1000
4.	W-3 Study-Assess Spring Flow Reduction, MOWE	Research		45,000								
5.	RM-1 Preservation of Sycamores	Mgmt.	500		500		500		500		500	
6.	A-1 Archeological Site Survey & Structure Report	Research				25,000						
7.	A-3 Study of Prehistoric Land	Research						20,000				
8.	W-2 Water Resources Management Plan	Research						10,000				

** - Base - Funds available for use in park base.

*** - New - Funds unavailable in park and requested from Western Regional Office (WRO)

**** - This project is presently funded by Water Resources Division, WRO

RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Montezuma Castle National Monument, Western Region.
2. PROJECT NAME AND NUMBER: Stabilization Castle Ruins (MOCA-A-2).
3. STATEMENT OF PROBLEM: The castle ruins has various areas which need grouting and pointing to halt and prevent further erosion.
4. WHAT HAS BEEN DONE: From 1925 to 1928 Frank Pinkley and Martin Jackson performed extensive repairs on the castle. Closed to the public in 1951 owing to structural weaknesses, stabilization has been confined largely to waterproofing roofs in the outer exposed tier of rooms, correction of internal stresses, and resurfacing eroded facings as they occurred.
5. DESCRIPTION OF THE WORK TO BE UNDERTAKEN: All eroded areas will be repaired, grouted, and pointed.
6. LENGTH OF TIME NEEDED: Continuing
7. WHAT WILL HAPPEN IF THE PROJECT IS NOT UNDERTAKEN: Continued erosion of the castle.
8. WHAT ARE THE ALTERNATIVES:
 1. No action.
 2. Stabilize the structure without a safety study.
9. PERSONNEL: Study by a Group Team plus RSU staff; stabilization by monument personnel.
10. ADMINISTRATION AND LOGISTICS:

FUNDING	Year in Program Sequence				
	1st	2nd	3rd	4th	5th
Personal services					
Other than personal services					
GRAND TOTAL					
Funds available in Park base	500	500	500	500	500
Funds requested from Regional Office	1,000				

11. MANAGEMENT AND ASSESSMENT NEEDS:
- | | <u>Required</u> | <u>Done</u> |
|---|-----------------|-------------|
| a. List of classified structures | | X |
| b. Nomination to the National Register of Historic Places | | X |
| c. E.O. 11593 report | | X |
| d. Section 106 report | | X |
| e. Environmental Assessment: | | X |
| By professional inspection of site | X | |
| f. Historic Structures Report | X | |
12. REFERENCES AND CONTACTS:
- a. Jackson, Earl
 1941 Stabilization of Montezuma Castle. Ms. Arizona Archeological Center: Tucson.
 - b. Richert, Roland
 1958 Stabilization Records, Montezuma Castle National Monument. Arizona Archeological Center: Tucson.
 - c. Richert, Roland and Charles Voll
 1964 Ruins Stabilization at Montezuma Castle National Monument. Arizona Archeological Center: Tucson.
13. DATE OF SUBMISSION: Originally submitted: January 1, 1975
Revised: April 30, 1981

NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Montezuma Castle National Monument, Western Region
2. PROJECT NAME AND NUMBER: Eradication/Control of Corbicula fluminea (Asiatic clam) (MOCA-N-2).
3. STATEMENT OF PROJECT: Ongoing research of the aquatic fauna of Montezuma Well has determined that an exotic clam, Corbicula fluminea, has been introduced into the irrigation system supplied by the outflow of Montezuma Well. Research is needed as to the extent of the threat caused by the clam, and the best method(s) of eradication or control if this is determined necessary.
4. WHAT HAS BEEN DONE: Identification of the exotic clam.
5. DESCRIPTION OF WORK TO BE UNDERTAKEN:
 - a. Survey and define the limits of the clam population.
 - b. Determine the best method(s) of eradication if necessary.
 - c. Establish monitoring procedures to insure complete eradication of the exotic.
6. LENGTH OF TIME NEEDED: Two years.
7. WHAT WILL HAPPEN IF PROJECT NOT UNDERTAKEN: A possibility that the exotic clam will infiltrate into Montezuma Well itself. The ecology of the Well is in an apparent balanced state, with species endemic to the Well (Hyalella montezuma and Fontelicella n. sp.). Introduction of such an exotic may cause irreparable damage to the present ecosystem.
8. WHAT ARE THE ALTERNATIVES:

Proposed Action: Identify and remove (eradicate) complete population of Corbicula fluminea.

No Action: Continue present management. Historic maintenance cleaning of the irrigation system in itself may be a controlling, but not eradicating factor.
9. PERSONNEL: Regional assistance (direct or by contract) to determine numbers and coverage of clam population and best methods of eradication.

10. ADMINISTRATION AND LOGISTICS:

<u>Funding</u>	<u>Year in Program Sequence</u>				
	<u>1st</u>	<u>2nd</u>	<u>3rd</u>	<u>4th</u>	<u>5th</u>
Personal Services					
Other than personal services					
Grand Total	0	0	0	0	0
Funds available in park base	0	0			
Funds requested from Regional Office	0	0			
<u>On Form</u> N/A					
				<u>Date Submitted</u>	

Funds are not requested at this time. Texas Christian University is doing research now and when it is complete, we will be in a better position to asses any needs.

11. REFERENCE AND CONTACTS:

12. DATE OF SUBMISSION: April 30, 1981

NEED FOR THE PROPOSAL: Corbicula fluminea is an exotic species of freshwater clam found in the irrigation system that is supplied by the waters of Montezuma Well. Research is needed to determine and define the threat of the clam and appropriate control/eradication.

ALTERNATIVE ACTIONS IMPACT CATEGORIES	PROPOSED ACTION	NO ACTION	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE
	Integrated research and eradication program.	Do nothing to define the problem or eradicate the clam.				
Native aquatic fauna	Remove this possible competitive species that could replace/displace natural species.	Possible elimination of native aquatic species.				

RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Montezuma Castle National Monument,
Western Region
2. PROJECT NAME AND NUMBER: Hydrological Studies (MOCA W-1)
(revised 11/83)
3. STATEMENT OF THE PROBLEM: The Monument needs baseline information to assess the condition and trend of the area's hydrologic resources. Developments near the monument could seriously alter the area's hydrological regime. The hydrologic resources are second only to the ruins in importance to the monument.
4. WHAT HAS BEEN DONE: Montezuma Well has been the subject of a number of scientific studies. Flow from the Well into an irrigation ditch and thence across the monument was measured from 1956 to 1970, providing approximately fifteen years of historical data. The USGS has maintained stream gauging stations on Wet and Dry Beaver Creeks since 1961 and 1957 respectively. In 1977, the Service moved to contract with the USGS to establish and maintain a gaging station on the stream which issues from the limestone sink.
5. DESCRIPTION OF WORK TO BE UNDERTAKEN: Flow measurements at Montezuma Well in the irrigation ditch will be taken to gather baseline information which can be used to assess future changes in the monument's hydrologic regime. The water level data acquired in the monitoring programs and data obtained from the USGS stream gauging stations on Wet and Dry Beaver Creeks will be analyzed to determine the relationship between stream flow and ground water levels.
6. LENGTH OF TIME NEEDED: On-going
7. WHAT WILL HAPPEN IF THE PROJECT IS NOT UNDERTAKEN: Without the proposed monitoring, the monument will lack baseline information necessary for assessing changes in the area's hydrologic regime. If no action is taken the monument will lack information necessary for the efficient management and protection of the hydrologic resources.
8. WHAT ARE THE ALTERNATIVES: No action.
9. PERSONNEL: The work will be performed by USGS

10. ADMINISTRATION AND LOGISTICS:

FUNDING	1st	2nd	3rd	4th	5th
Personnel Services	1850	1850	1850	1850	1850
Other					
GRAND TOTAL	1850	1850	1850	1850	1850
Fund available in park base	0	0	0	0	0
Funds requested from					
Regional Office	1850	1850	1850	1850	1850

Project is currently funded by Division of Water Resources,
Western Region

11. REFERENCE AND CONTACTS:

12. DATE OF SUBMISSION: Originally submitted - 1/1/75
Revised 4/40/81
Revised 11/7/83

RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Montezuma Castle National Monument, Western Region.
2. PROJECT NAME AND NUMBER: Preservation of Sycamores in Castle Area (MOCA-RM-1).
3. STATEMENT OF PROBLEM: The monument is in danger of losing a number of Sycamore trees in the Castle unit. It is most important that these trees be preserved as they are a part of the natural and historic scene. These trees are in a heavily impacted area containing the visitor center and picnic area. The trees have been subject to heavy disease and insect infestation problems for many years, while trees adjacent to but not in the heavily impacted area are doing well with minimal disease and insect infestation. U.S. Forest Service pathologists believe the disease problem to be a fungus known as anthracnose and the insect problem to be the Sycamore lacebug (Corythucha confraterna). It is not known which problem is the greater.
4. WHAT HAS BEEN DONE: Forest pathologist and entomologists of the U.S. Forest Service have studied the problem and at their suggestion the trees have been treated for many years. Treatment has consisted of fertilizing, removal of dead leaves and debris from under the tree crowns, and spraying the trees with a solution of malathion and zineb. This has been done annually for the past twenty years.
5. DESCRIPTION OF THE WORK TO BE UNDERTAKEN: The monument will continue to annually fertilize and spray infected trees within the heavily impacted area containing the visitor center and picnic area. The fertilizer to be used will be a common type containing nitrogen, phosphorus, potassium and other elements as the need is identified. The trees will continue to be sprayed with a one percent solution of malathion to which a spreading agent has been added until more effective sprays are found. Anthracnose spores accumulate in the leaf litter under the affected trees. In order to remove this source of infective materials the litter under diseased trees within the heavily impacted area will be periodically removed. In those areas where litter removal will have serious adverse impacts on soil structure, compaction or aeration, an alternate mulch will be applied and/or the soil will be aerated manually.

If a spray capable of killing the anthracnose spores in the litter is found the litter removal program will be discontinued. As the Forest Service identifies new and more effective means for preserving the Sycamores these methods will be incorporated into the preservation program.

6. LENGTH OF TIME NEEDED: This is a continuing project.
7. WHAT WILL HAPPEN IF PROJECT NOT UNDERTAKEN: The trees will probably succumb to the disease and insect infestation. This would drastically alter the scene at Montezuma Castle.
8. WHAT ARE THE ALTERNATIVES:
 1. No action.
 2. Conduct only one or two of the three proposed treatments.
9. PERSONNEL: The work will be performed and in the late spring or early summer (April or May) at a time when the infestation of lacebug has begun to be noticeable and damage to the foilage is starting to appear.
10. FUNDING

	Year in Program Sequence				
	1st	2nd	3rd	4th	5th
Personal services					
Other than personal services	500	500	500	500	500
GRAND TOTAL	500	500	500	500	500
Funds available in park base	500	500	500	500	500
Funds requested from Regional Office					
11. REFERENCES AND CONTACTS:
 - a. Staff Specialist Don Lucht, Forest Service Regional Office, Albuquerque, New Mexico
12. DATE OF SUBMISSION: Originally submitted: January 1, 1975

RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Montezuma Castle National Monument, Western Region.
2. PROJECT NAME AND NUMBER: Archeological Site Survey and Structure Report (MOCA-A-1).
3. STATEMENT OF PROBLEM: The survey of Montezuma Castle is inadequate in that: (1) there is not enough information about the known sites; (2) they are not dated precisely; (3) there is no topographic information on the base maps. There is no coordinated file on each site itemizing the known cultural features, investigations, environmental and human impact. The file will include a plane table map and topo of each site.
4. WHAT HAS BEEN DONE: A survey of the monument area in the 1946-1950 period on an off-duty basis and a survey in 1952-1953 located the large and obvious sites. A few of the more spectacular multi-room pueblos were mapped. The survey plotted in some of the canals. The excavation of Castle "A" in 1933-34 added some information to a specific structure. Montezuma Castle has been mapped also. The work at Swallet Cave and NA 4616 have added additional information for the open file.
5. DESCRIPTION OF THE WORK TO BE UNDERTAKEN: Re-map all sites, topographic surface features, and topography with a plane table for the "open file." Place all sites on a set of masters by phase. Study each site to get the maximum amount of data concerning the dating, population of the site, changes, and cultural affinity. Place all pertinent biotic information on the master pertaining to land use. This open file would place the main archeological resources into their proper context, upgrade interpretive data to a level concomitant to current theoretical interests, and give a comparative data base for park management of nonrenewable cultural resources.
6. LENGTH OF TIME NEEDED: 1 year.
7. WHAT WILL HAPPEN IF PROJECT NOT UNDERTAKEN: The data base for interpretation of the monument will remain inadequate by current theoretical standards. The interpretive prospectus and background of the monument will remain sub-standard in

terms of current research interests, goals and interpretations. Non-renewable resources will be subject to unmonitored adverse conditions that will eventually lead to salvage rather than protection.

8. WHAT ARE THE ALTERNATIVES:

1. No action.
2. Conduct only a portion of the proposed study.

9. PERSONNEL. This project could be negotiated by a contract with an organization such as the Northern Arizona University or the Museum of Northern Arizona.

10. ADMINISTRATION AND LOGISTICS:

FUNDING	Year in Program Sequence				
	1st	2nd	3rd	4th	5th
Personal services		25,000			
Other than personal services					
GRAND TOTAL		25,000			
Funds available from park base		0			
Funds requested from Regional Office		25,000			

11. MANAGEMENT AND ASSESSMENT NEEDS:

Required Done

- a. List of classified structures X
- b. Nomination to National Register of Historic Places X
- c. Land Classification Review X

12. REFERENCES AND CONTACTS:

- a. Breternitz, David A.
1960 "Excavation at three sites in the Verde Valley, Arizona." Museum of Northern Arizona Bull. 34:
Flagstaff

b. Jackson, Earl and Salley Van Valkenburgh
1954 "Montezuma Castle Archeology, Park I:
Excavation." Southwestern Monuments Association
Technical Series, Vol. 3, pt. 1: Globe.

c. Ladd, Edmund
1964 Salvage, Swallet Cave Ruins, NA4630 at
Montezuma Well. Ms. Arizona Archeological
Center: Tucson.

13. DATE OF SUBMISSION: Originally submitted: January 1, 1975
Projected cost of project revised: April 30, 1981

RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Montezuma Castle National Monument, Western Region.
2. PROJECT NAME AND NUMBER: Study of Prehistoric Land Use (MOCA-A-3).
3. STATEMENT OF PROBLEM: The Well and Castle area appear to have a complex of prehistoric irrigation ditches that could give considerable insight into intensive farming techniques on the tributaries. The canals are outlined by carbonate deposits in the soil. The survey of the network should be accompanied by studies of carbonate accumulations in the soils served by the modern ditch.
4. WHAT HAS BEEN DONE: Part of the prehistoric canal system is still in use today. Minor segments of the canal were noted and approximated during the 1952-53 monument survey. A small section of an upper canal has been exposed along the road to the picnic grounds.
5. DESCRIPTION OF THE WORK TO BE UNDERTAKEN: (1) aerial survey of the monument using remote sensing to trace subsurface moisture retention and flows in early spring; (2) intensive ground survey followup accompanied by testing to confirm remote sensing data; (3) studies of carbonate salt buildups from intensive irrigation and its impact on soil fertility.
6. LENGTH OF TIME NEEDED: 1 year.
7. WHAT WILL HAPPEN IF THE PROJECT IS NOT UNDERTAKEN: An incomplete data base for the interpretive program at the monument. Loss of information concerning the parameters of prehistoric land use.
8. WHAT ARE THE ALTERNATIVES: No action.
9. PERSONNEL: Contract research personnel.
10. ADMINISTRATION AND LOGISTICS:

FUNDING	Year in Program Sequence				
	1st	2nd	3rd	4th	5th
Personal services			18,000		
Other than personal services			2,000		
GRAND TOTAL			20,000		
Funds available in Park base			0		
Funds requested from Regional Office			20,000		

- | 11. <u>MANAGEMENT AND ASSESSMENT NEEDS:</u> | <u>Required</u> | <u>Done</u> |
|--|-----------------|-------------|
| a. Section 106 report | X | |
| b. Environmental Assessment: | | |
| 1. On existing data | X | |
| 2. By professional inspection
of site | | |
| 12. <u>REFERENCES AND CONTACTS:</u> | | |
| 13. <u>DATE OF SUBMISSION:</u> Originally submitted: January 1, 1975 | | |
| Projected cost of project revised: April 30, 1981 | | |

NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Montezuma Castle National Monument, Western Region
 2. PROJECT NAME AND NUMBER: Park Water Resources Management Plan (MOCA-W-2)
 3. STATEMENT OF PROBLEM: In compliance with Public Law 92-500 (Federal Water Pollution Control Act) and as amended by Public Law 95-217 (Clean Water Act of 1977) and as furthered by the Service Memorandum of Understanding with Environmental Protection Agency (EPA), each area must develop a Park Water Plan.
 4. WHAT HAS BEEN DONE: No comprehensive water quality management plan has been developed for the area.
 5. DESCRIPTION OF WORK TO BE UNDERTAKEN:
 - a. An historical report on management of water resources in the park.
 - b. Classification of all surface waters by present and proposed uses.
 - c. An analysis of the present status of park waters, including:
 - (1) Identification of water quality required to support specified uses and, where appropriate, to comply with or assist in establishing State water quality standards.
 - (2) Relationship of water quality to any threatened, known, rare or endangered species indigenous to the park and the relationship of water quality to the protection of all natural resources.
 - (3) A bibliography of available information concerning the existing quality of park waters.
 - d. A description of proposed actions relating to management of park waters.
 - e. A detailed plan for monitoring the quality of park waters that will reveal existing water quality and significant trends.
- Future coordination/cooperation with EPA and the State is required to ascertain established water standards.
6. LENTTH OF TIME NEEDED: 5 years
 7. WHAT WILL HAPPEN IF PROJECT NOT UNDERTAKEN: Service noncompliance with the above Federal Laws.

8. WHAT ARE THE ALTERNATIVES: None

9. PERSONNEL: Regional assistance with contracted U.S. Geological Survey to develop/initiate basic aspects. After which, future monitoring will be done by area staff.

10. ADMINISTRATION AND LOGISTICS:

<u>Funding</u>	<u>Year in Program Sequence</u>				
	<u>1st</u>	<u>2nd</u>	<u>3rd</u>	<u>4th</u>	<u>5th</u>
Personal Services					
Other than personal services					
Grand Total					
Funds available in park base					0
Funds requested from Regional Office					10,000
<u>On Form</u>	<u>Date Submitted</u>				

11. REFERENCES AND CONTACTS:

12. DATE OF SUBMISSION: July 15, 1981

NEED FOR THE PROPOSAL:

Basic water quality studies are needed to provide base data and insure that management is in compliance with PL 92-500 and as amended by PL 95-217 and as furthered by the Service Memorandum of Understanding with EPA.

ALTERNATIVE ACTIONS IMPACT CATEGORIES	PROPOSED ACTION	NO ACTION	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE	ALTERNATIVE
	Compliance with Public Law, agency policy and research.	Service non-compliance with the above Federal laws.				
Water Quality	Insure no monument activities will de-grade water supplies passing through monument.					
Visitor Use	Should cause no impact on visitor use.					
Management	Should provide guide-lines to insure compliance with Federal laws and provide data base to allow service to address future/potential external threats to the monument.					

RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Montezuma Castle National Monument,
Western Region
2. PROJECT NAME AND NUMBER: A Study to Assess the Reduction of
Spring Flow From Montezuma Well
(MOCA W-3)
3. STATEMENT OF THE PROBLEM: Review of data acquired from the
gaging station at Montezuma Castle National Monument indicates a
much wider range in flow than would be expected from natural
causes. Rather abrupt changes in the rate of flow have taken
place several times during the record. These changes are
unexplained. Of particular interest is the large range that can
occur in a short period of time. (e.g., 3.0 cfs on April 3-6 1980
to 2.4 cfs on May 16, 1980.) The concern is that the natural
flow of the spring in Montezuma Well is being altered by ground
water withdrawal to the south of the park, or that a gaging type
problem exists.

In the 1960's and 1970's a sizeable community was developed to the south of the monument. This community utilizes groundwater for its water supply. The potential for additional development in proximity to the park has prompted concern that the natural spring flow which generates the pond of Montezuma Well (within a limestone sink) may be adversely affected.

4. WHAT HAS BEEN DONE: Flow from the Well into an irrigation ditch and across the monument was measured from 1956 to 1970, providing approximately fifteen years of historical data. The USGS has maintained stream gauging stations on Wet and Dry Beaver Creeks since 1961 and 1957 respectively. In 1977, the Service contracted with the USGS to establish and maintain a gaging station on the stream which issues from the limestone sink. The USGS has also been contacted and subsequently a proposal for undertaking this study was submitted (6/11/82). A copy of their proposal is attached to this statement.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN: A reevaluation of the physical parameters at the monument, including the stream and gaging station as well as a review of all existing data. Additionally, a history of community pumping records and correlation of longterm flow records of other springs in the area will be compiled and reviewed to evaluate the cause of changes in the flow from Montezuma Well. Specifically, the following tasks are proposed:

A. Inspect the crater (lake) and outlet for any evidence of changes in water level, and seek and compile information from all sources on observed changes.

B. Compare discharges from the crater with base flows of

nearby streams. Use this analytical procedure to extend the record of flow from the well using measurements made in the period 1948 to 1976 as a check.

C. Develop a history of pumping and water levels in the heavily pumped area to the south and evaluate the extent of any impact it may have on water levels in, and discharge from, the well.

6. LENGTH OF TIME NEEDED: 1 year

7. WHAT WILL HAPPEN IF THE PROJECT IS NOT UNDERTAKEN: If this study is not conducted now, it will not be possible to observe the hydrological indicators of man-induced spring flow decline. Monitoring alone is not sufficient to answer this management question. If no action is taken, it is possible that the Service will lose its right, under State law, to protest this loss. Hydrologically, if the conditions maintaining this artesian fed spring are destroyed, it is likely the spring will never flow again.

8. WHAT ARE THE ALTERNATIVES: No action.

9. PERSONNEL: Performed under contract by USGS

10. ADMINISTRATION AND LOGISTICS:

FUNDING	1st	Year in Program 2nd	3rd	Sequence 4th	5th
Personnel Services	45,000	0	0	0	0
Other	0	0	0	0	0
GRAND TOTAL	45,000				

Funds available in park base 0
Funds requested from Regional
Office 45,000

11. REFERENCES AND CONTACTS:

U.S. Geological Survey, letter dated 6/11/82

12. DATE OF SUBMISSION: 11/7/83

L54 (WR-RNW)
MOCA/USGS

May 7, 1982

Memorandum

To: U.S. Geological Survey, District Chief, Water Resources Division,
301 West Congress, Tucson, Arizona 85701

From: Chief, Division of Water Resources, Western Region

Subject: Gaging station at Montezuma Castle National Monument, Arizona
Station # 09505260

After a review of the data acquired from the subject gaging station since its establishment on April 1, 1977, we are concerned that the natural flow of the spring in Montezuma Well is being altered by ground water withdrawal to the south of the park, or that we are having some type of problem with gaging of the flow such that the station is not fulfilling its intended purpose. In establishing this station, it was our desire to acquire background data on the natural flow of the spring, thus enabling us to move legally to protect this valuable park resource in the event that future activities by man were to reduce the natural flow.

Our review of the data record indicates a much wider range in flow than we would have expected from natural causes. Of particular interest is the large range that can occur in a short period of time, e.g., 3.0 cfs on April 3 - 6, 1980 to 2.4 cfs on May 16, 1980. Thus, it appears that either the flow is being reduced by local ground water withdrawal or that we have some type of gaging problem.

We would appreciate your submittal of a proposed study to review the station record and evaluate our efforts to achieve the project goal. We understand that you have recently done hydrologic work in the Verde Valley and thus this may be an especially appropriate time to look into this problem.

(Sgd) Gerard S. Witucki

cc:
Supt., Montezuma Castle



DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Water Resources Division
301 W. Congress, Box FB-44
Tucson, Arizona 85701

June 11, 1982

Memorandum

To: Chief, Division of Water Resources, Western
Region, National Park Service, San Francisco, CA

From: District Chief, WRD, Tucson, AZ

Subject: Gaging station at Montezuma Castle National
Monument, Arizona, Station #09515260

Sorry for the long delay in answering your memorandum of
May 7 regarding the gaging station at Montezuma Castle
(09515260).

I asked Byron Aldridge to review the data and the following
are the comments he submitted.

"The discharges during the particular period
referred to in your memorandum are verified by
measurements of 2.96 cfs on March 12 and 2.50
cfs on May 1. The rate of dropoff between the
two measurements could vary according to how
the shift is graduated from plus .07 on
March 12 to minus .08 on May 1. The high dis-
charge on March 12 occurred after the ditch
was sealed to stop leakage, but the amount of
fluctuation noted could be due to changes in
ET in the crater and ditch.

Of much more significance is the drop in dis-
charge in 1981-82, base discharge drops to
1.9 ft³/s. The drop in base discharge is
real. It does not appear to be due to leak-
age or gaging procedures. Base discharge
increased to 2.6 in February 1982.

The fluctuation discussed in the memorandum is much less than is recorded by past discharge measurements. Measurements made from 1948 to 1976 show a range from 1.4 cfs to 2.94 cfs. It appears that 1978-1980 are above average years and that 1981-1982 are very near the average. The base flow of West Clear Creek is about 25% lower in 1981 than it was in 1978 and 1979."

To meet your objectives in this matter we would propose the following tasks.

1. Inspect the crater and outlet for any evidence of changes in water level, and seek and compile information from all sources on observed changes.
2. Compare discharges from the crater with base flows of nearby streams. Use this analytical procedure to extend the record of flow from the well using measurements made in the period 1948 to 1976 as a check.
3. Develop a history of pumping and water levels in the heavily pumped area to the south and evaluate the extent of any impact it may have on water levels in, and discharge from, the well..

Looking at our manpower availability, we could do this work for you over the course of a year from start to finish. A rough estimate of cost would be \$30,000-\$45,000. The number of wells involved and the expected complexity of reconstructing pumping history are the principal contributors to the high cost.

If you are interested in proceeding with the study, we will develop a detailed proposal with refined estimates of costs and a schedule for report production. Don't hesitate to call if you have any questions.



Robert D. Mac Nish

*AIR QUALITY
GENERAL STATEMENT*

As an addendum to the

*MONTEZUMA CASTLE NATIONAL MONUMENT RESOURCES
MANAGEMENT PLAN*

At present, there is not an air quality threat to the monument.

*An air quality sampler furnished by the State of Arizona monitors
total suspended particulates.*

STATUS OF RESOURCES PROJECTS

MONTEZUMA CASTLE NATIONAL MONUMENT

January, 1984

The following is a status report on resource projects

<u>Reference Numbers</u>	<u>Project Title</u>	<u>Status of Project</u>
NATURAL RESOURCE PROJECTS		
MOCA-RM-1	Preservation of Sycamores	Underway
MOCA-W-1	Hydrological Studies	Underway - U.S.G.S. installed new gauging station F.Y. 81 - need 3-4 years of data collection
MOCA-N-1	Visitor Carrying Capacity Study	Deferred
MOCA-W-2	Water Resources Management Plan	Proposed; not started funds not yet available
MOCA-W-3	Study - assess MOWE Spring Flow Reduction	Proposed; not started funds not yet available
MOCA-N-2	Eradication of Asiatic Clam	Research in program by Texas Christian University
CULTURAL RESOUCE PROJECTS		
MOCA-A-1	Archeological Site Survey and Structure report	Proposed; not started funds not yet available
MOCA-A-2	Stabilization Castle Ruins	Underway; major pointing and grouting is complete but not to desired maintenance status
MOCA-A-3	Study of Prehistoric Land Use	Proposed; not started funds not yet available

NEEDS FOR ASSESSMENT OF CULTURAL RESOURCES
EFFECTED BY DEVELOPMENT PROJECTS

Explanation

Assessment: This consists of a review of a proposed development project to determine if it will affect cultural resources. It will determine if field inspection is required to determine effects, what steps are required to mitigate impact on the resources, and what steps are necessary to comply with legislation and policies on historic preservation. Assessment will be made with the concurrence of the regional office, according to current guidelines for environmental assessment.

Field Inspection and Report: If the project has the potential for disturbance of new ground, and if it is not documented by a report of previous field inspection, an on-site inspection or intensive survey by a professional archeologist should be provided for. If inspection shows that no cultural remains will be affected, a report by the archeologist can be used to document a determination of no effect, based on an archeological clearance by the Regional Archeologist. Projects that may require inspection are: fence construction, utility lines burial, water-sewer system burial; building construction, or trail or road construction. In areas that are known to have cultural resources on or below the surface it may be necessary to perform professional test excavations to insure that no cultural resources will be disturbed by any proposed projects.

E.O. 11593 Report: If the proposed action may result in the transfer, sale, demolition, or substantial alternation (adverse effect) of a potential National Register property, or land under the control or jurisdiction of the National Park Service, the expected effects must be reported, according to the latest procedures of the Advisory Council on Historic Preservation. Determination of effects will require professional assessment and/or field inspection.

Section 106 Report: If a project will affect a National Register property, steps must be taken to comply with Section 106 of the Historic Preservation Act as described in the latest procedures published in the Federal Register by the Advisory Council on Historic Preservation. Determination of effects will require professional assessment and/or field inspection.

Participation in planning, meetings, etc.: This activity involves having archeological consultation in master planning, development planning, interpretive planning, etc., to insure that such plans do not present any adverse impacts to cultural resources.

This professional participation can also be applied to reviews of other indirectly related projects, such as flora/fauna studies, water resource studies, etc.

MAINTENANCE STABILIZATION PROGRAM

MONTEZUMA CASTLE NATIONAL MONUMENT

I. MAINTENANCE SITES

A. Summary

1. Total number of sites: 9
2. Total Size: 41 rooms, 787 linear feet and 6,296 square feet.
3. Priority: Annual inspection of the main castle. Inspections by the area staff oftener, as required. Five sites - once every 5-10 years, four sites - one every 5 years.
4. Visitation: 400.0 visits (thousands) Jan.-Dec. 1973.

II. RUINS OR RUIN GROUPS

A. Montezuma Castle

1. Size: 20 rooms on five levels; 213 linear feet and 3,284 square feet.
2. Use: The focal point of interpretation. Not entered by the public.
3. Condition: Excellently preserved but fragile.
4. Type of Stabilization: Comprehensive.
5. Last Stabilization: 1971.
6. Remarks: Montezuma Castle is an exceptionally well-preserved, 20-room cliff dwelling located some 80 feet high in a natural cave in the limestone formation on the north bank of Beaver Creek, a tributary of the Verde River. Its state of preservation and the setting in which it is found make it one of the most remarkable and picturesque works of prehistoric man in America. The building was constructed during the period 1100-1400 as a high rise dwelling. Closed to the general public in 1951 owing to structural weaknesses, stabilization has been confined largely to waterproofing roofs in the outer, exposed tier of rooms, correction of internal stresses or strains, and resurfacing eroded facings as they occur.

From 1925-1928 Frank Pinkley and Martin Jackson performed extensive repairs to the front, weathering portions of the Castle, mainly the exterior facings of two rooms, the repair of one balcony roof, and partial restoration of the upper story of the Tower Room.

The entire south, outer wall of the first three floor levels involving Rooms 13 through 16 bear the brunt of driving rains and winds. The soil mortar plaster applied 40 years ago by Pinkley and Jackson has now eroded down to the stone facing.

7. Priority: It is recommended that the next major job should be that of replastering with matching soil mortar the exterior wall surface of the lower three floor levels.

B. Castle "A"

1. Size: Wall stubs of approximately six or eight rooms and two or three cavate lodges are under stabilization, totaling an estimated 150 linear feet and 600 square feet of wall area.
2. Use: Very heavy. Entered by visitors along a self-guided trail. Nearly every visitor to Montezuma Castle enters Castle "A."
3. Condition: Good.
4. Type of Stabilization: Comprehensive.
5. Last Stabilization: 1968
6. Remarks: Castle "A," located 100 yards east of the main site, originally contained five stories with possibly a balcony or parapet level at the top, and a total of at least 45 domestic rooms plus smaller cavate storage areas. A concrete and asphalt walkway leads visitors through the site, and a ladder with hand-rails extends up to a complete cavate dwelling, with doorway and smokehole. Considering the tremendous usage this ruin receives, it looks quite good. The site is largely maintained by the area staff doing grouting, pointing, and wall repair as required.

Some of the work is too dark, but this could be remedied by going over it with soil mortar. Small intermittent sections of differentially weathered limestone banks along the front row of rooms may have to be shored by concealed riprap.

7. Priority: With Maintenance Stabilization required at other sites in the monument at intervals of 4-5 years on the average, special problems at Castle "A" are handled at the same time.

C. Montezuma Well Cliff Dwellings, NA 1271 and NA 1272 A and B

1. Size: 3 rooms, 78 linear feet and 594 square feet.
2. Use: Not open to the public. These are view sites.
3. Condition: Excellent.
4. Type of Stabilization: Basic.
5. Last Stabilization: 1964.
6. Remarks: These are three single-room cliff dwellings along the west side and below the rim of Montezuma Well. All three are unexcavated. They date from about 1150-1250 in the Honanki phase of the Southern Sinagua. They are seen from numerous points along the self-guided trail.
7. Priority: The 1964 stabilization placed these sites in excellent condition. Unauthorized entry and disturbance by visitors are their only enemies. Maintenance Stabilization should not be required until about 1980.

D. Montezuma Well Surface Pueblo, NA 1273A

1. Size: One room with standing walls has been stabilized involving 153 linear feet and 918 square feet.
2. Use: Heavy. Entered by visitors on a self-guided trail.
3. Condition: Excellent.
4. Type of Stabilization: Basic.
5. Last Stabilization: 1964.
6. Remarks: Except for one room or plaza with standing walls, this unexcavated ruin on the eastern rim of the Well is largely reduced to a rubble of limestone building stone. Probably two or three stories high originally, it may have contained about 50 rooms. It dates in the 1250-1400 period of the Southern Sinagua. One large room with significant exposed walls is immediately adjacent to the trail and because it was receiving considerable abuse from traffic, it was stabilized in 1964.

7. Priority: Future work here should be coordinated with proposed excavations. No maintenance other than usual cleanup in the ruin and along the trail will be required until such excavations are undertaken.

E. Montezuma Well Cavate Dwellings, Swallet Cave Ruin NA 4630A and Swallet Cave NA 4630B

1. Size: Eight rooms; 193 linear feet and 900 square feet.
2. Use: Heavy. Focal point of interpretation along self-guided trail.
3. Condition: Good.
4. Type of Stabilization: Comprehensive and Basic.
5. Last Stabilization: 1964.
6. Remarks: These two sites probably formed a more or less continuous unit just above the water's edge along the inside outlet of the Well. This area has been much disturbed and receives very heavy use today. NA 4630A was excavated and stabilized for interpretive use in 1960. It consists of seven small rooms with walls reduced to low remnants from one to four feet high. NA 4630B is a single room cavate, not formally excavated but probably dug before 1947 when the Well was added to the area. It is much the better preserved of the two sites, although the wall containing the only doorway was broken by modern traffic. Walls are made of rough limestone blocks laid with abundant mortar and are one stone wide.
7. Priority: Frequency of required stabilization is difficult to predict since this depends entirely on how unguided visitors treat the ruins. Maintenance will be tentatively scheduled at 5-10-year intervals.

F. Montezuma Well Communal Structure, NA 461C House 3, Pit House

1. Size: 780 feet of floor area; no walls.
2. Use: A secondary interpretive feature not entered by visitors. This is a wayside exhibit served by a turnout along the approach road to the Well.
3. Condition: Fair.
4. Type of Stabilization: Comprehensive and Related.

5. Remarks: This is a large, well-preserved floor of a Camp Verde phase house dating from 900-1100, excavated in 1958 by the Museum of Northern Arizona. It was backfilled, then a shelter constructed over it, re-excavated and preserved by the Service in 1960. The clay floor is delimited by a groove and regularly spaced post holes; it has a stepped bulbous entrance, hearth, trenched firescreen area, and two large post holes for former uprights. The floor was treated with a water repellant in 1965 and the fire pit was rehabilitated in 1971
6. Priority: Unattended, open in situ exhibits of fragile nature such as this one (except for protective roof) are difficult to maintain from vandalism. If this exhibit were all-enclosed and opened only during conducted tours, it could be preserved indefinitely. Aside from weekly or even daily cleanup, Maintenance Stabilization has been required at 4-year intervals.

