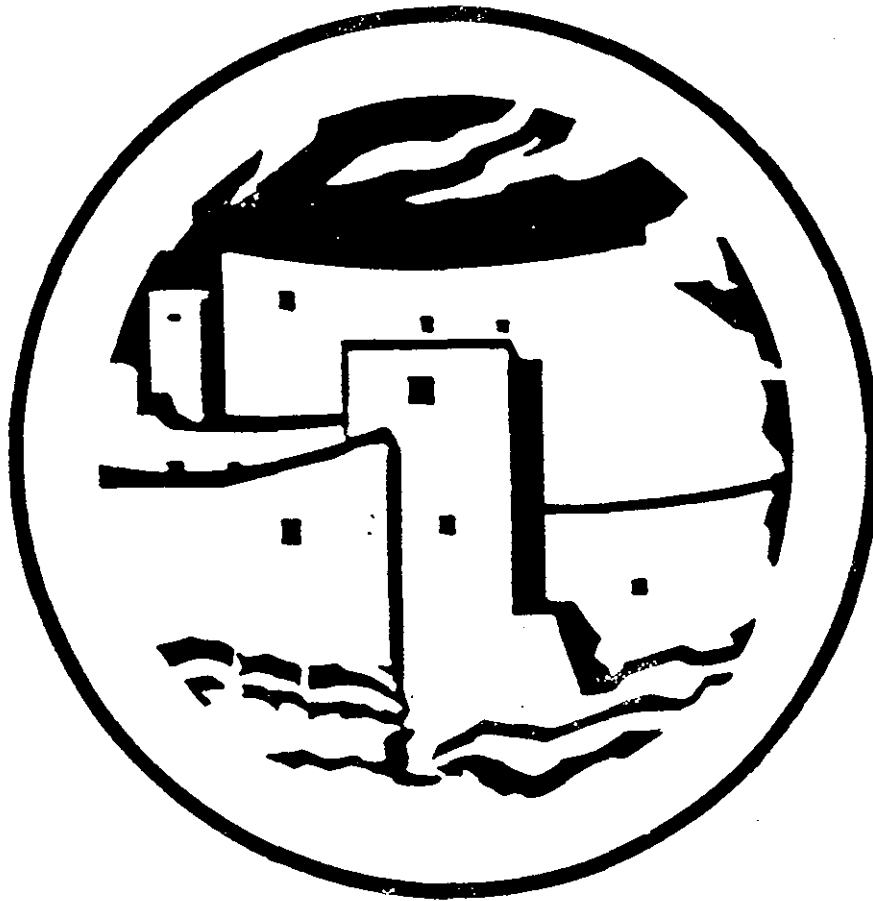


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**MONTEZUMA CASTLE NATIONAL MONUMENT  
RESOURCES MANAGEMENT PLAN**

**DECEMBER 1989**



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Resources Management Plan  
Montezuma Castle National Monument

December 1989 Revision

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## INTRODUCTION

### Legislation

Montezuma Castle National Monument, totalling 842 acres, is located in Yavapai County, Arizona, about 70 miles north of Phoenix (Figure 1). The monument consists of two separate operating units, the Montezuma Castle section and the Montezuma Well section. These two sections are about 19 miles apart and are located along Beaver Creek in the Verde Valley (Figure 2). The monument is centrally located in the state and is within the third Congressional District. There is only one private parcel in the monument, a tract of 16.83 acres, in the Montezuma Well section.

Montezuma Castle was established in 1906 under the authority of the Antiquities Act. The monument preserves a prehistoric structure known as Montezuma Castle, which is a 20-room, 5-story cliff dwelling of the prehistoric Sinagua culture. It is one of the best preserved cliff dwellings in America. The legislation states it "...is of the greatest ethnological value and scientific interest..." (Presidential Proclamation No. 696, December 8, 1906, 34 Stat. 3265). In 1937, government lands adjacent to the Monument were added as "...required for the proper care, management, and protection of the said prehistoric ruins and ancient cliff dwellings..." (Presidential Proclamation No. 2226, February 23, 1937, 50 Stat. 1817). In 1959, the boundaries were again enlarged "...in order to facilitate the administration and protection..." of the monument by an Act of Congress (June 23, 1959, 73 Stat. 108). The final boundary change came in 1978 with an Act of Congress to incorporate the adjacent fossil mammal tracks and exclude a section used as right-of-way for the freeway (Public Law 95-625, November 10, 1978, 92 Stat. 3473).

Montezuma Well was added in 1943 as a detached unit of the monument with an Act of Congress (October 19, 1943, 57 Stat. 572). It preserves an unusual example of a spring fed, large limestone sink as well as ruins and sites of prehistoric Hohokam and Sinagua periods and also historic Apache sites. In 1959, a few acres were added "...to facilitate the administration and protection..." of the monument by an Act of Congress (June 23, 1959, 73 Stat. 108).

### Cultural and Historical Background

Montezuma Castle is one of the most publicized archeological sites in the southwest and concern for its preservation, starting a century ago, was a major factor in the nation's historic preservation movement. Although the Castle itself was closed to

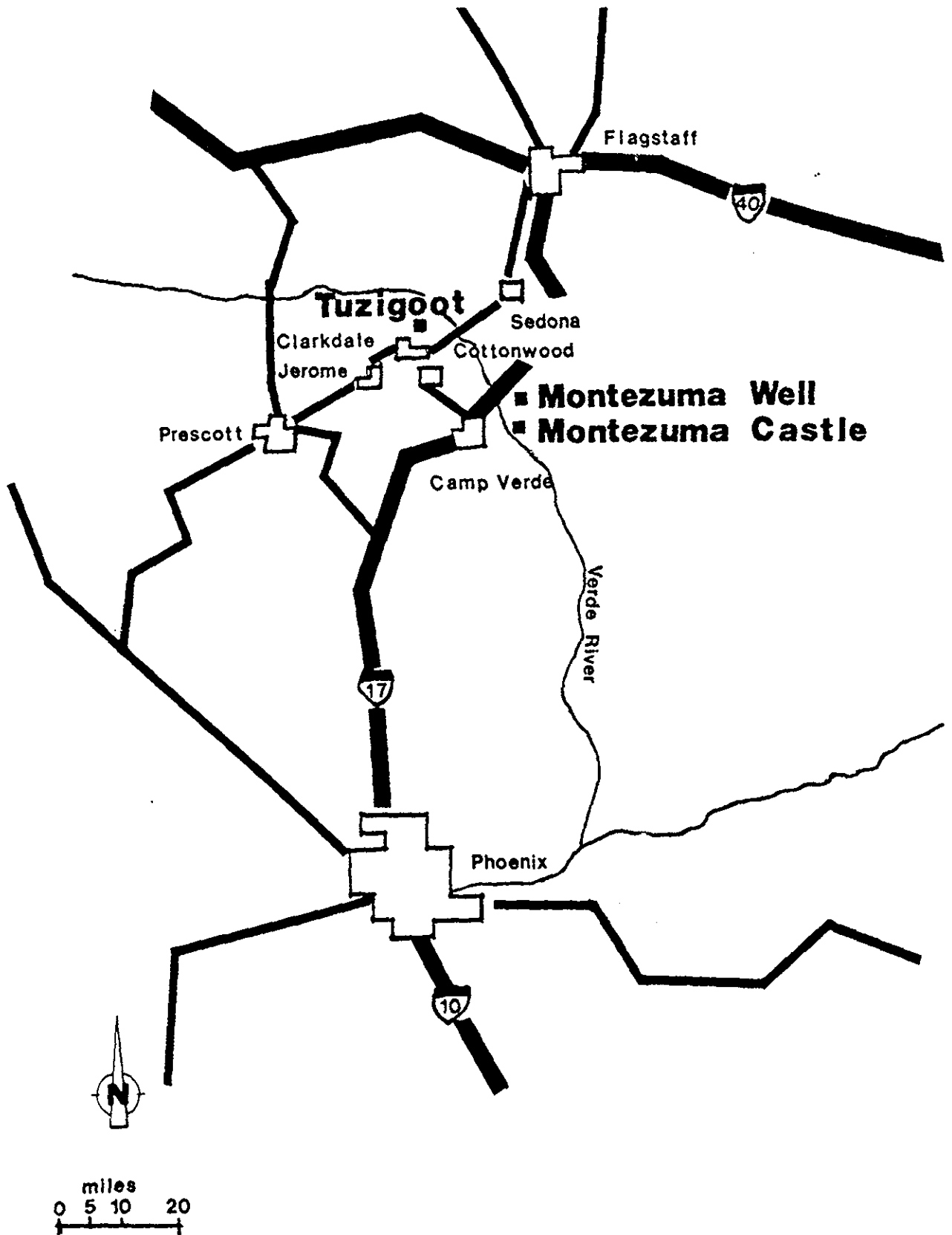


Figure 1: Location of Montezuma Castle and Montezuma Well relative to Phoenix and Flagstaff, Arizona.

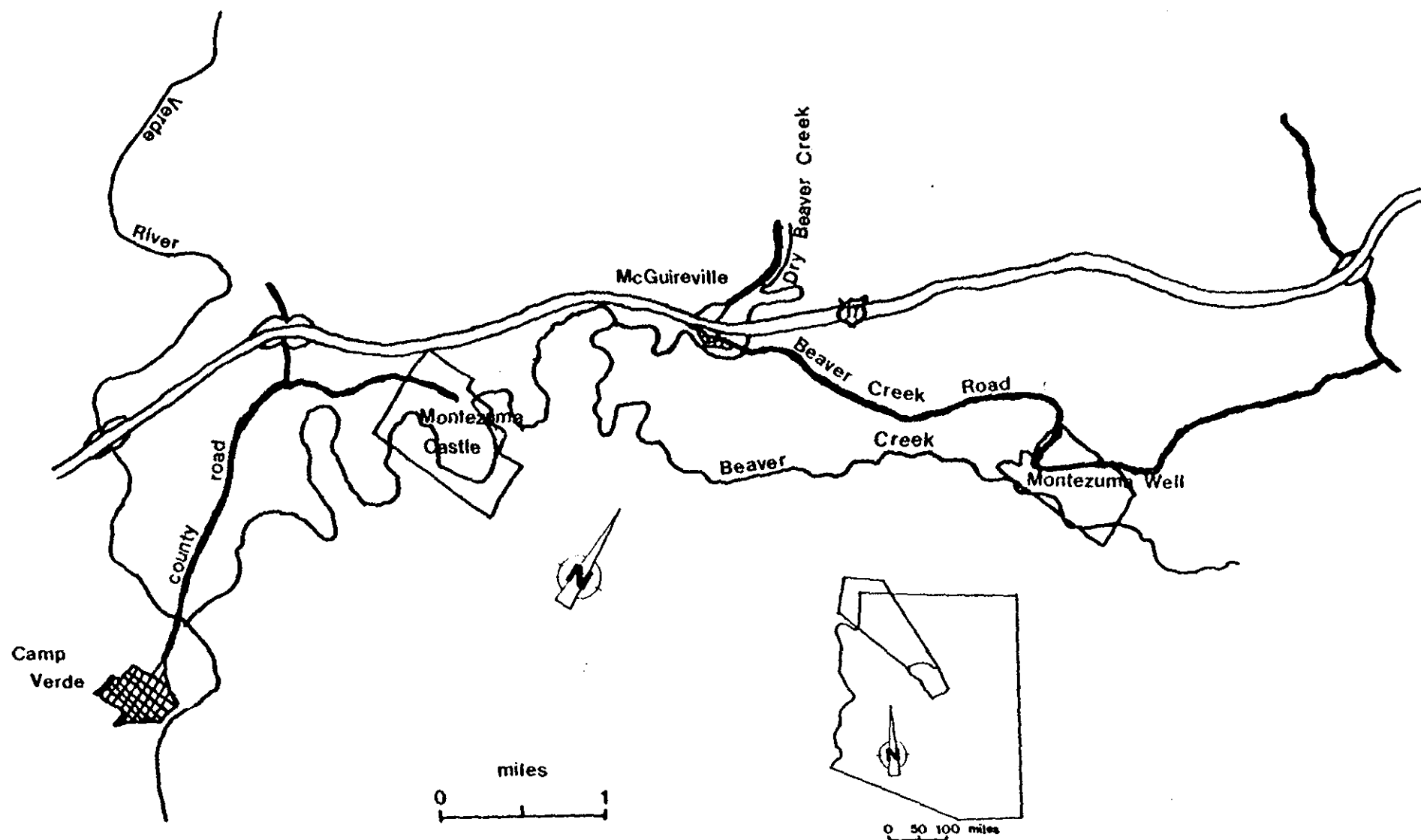


Figure 2: Location of Montezuma Castle and Montezuma Well along Beaver Creek.

the public in 1951, it is one of the most-visited prehistoric southwestern ruins in the country, and is the best-known Sinagua site.

Montezuma Castle National Monument preserves archeological sites and features representing Hohokam and Sinagua settlement in the Middle Verde drainage from approximately AD 600 to AD 1450. During this span of time, a native hunting/gathering population developed a strong irrigation-based horticultural economy, drawing on technological advances adopted from the Hohokam to the south and the Sinagua to the north. By AD 1300, the Verde River supported a hierarchical system of villages and population centers, integrated by exchange and seasonal interaction. This exchange network extended from the Mogollon Rim to the Sonoran Desert and beyond. Montezuma Castle is part of an estimated 100-room community which was an important component of this system. Beaver Creek was a major population area and a trail corridor into the Northern Sinagua region. The year round oasis at the Well must have been a major factor in settlement. Numerous prehistoric irrigation canals, most of which have been buried by sediments, lie within the monument. Farmlands along the creeks were primary sustaining areas for the Sinagua from which they drew the important foods and other products for survival and trade. These parcels were broken into many small flats, isolated by cliffs and the meandering stream. One of the largest parcels of arable bottomland lies in and adjacent to the Well. It appears that the Sinagua intensively farmed crops such as corn, beans, squash, and cotton. The riparian and surrounding uplands provided wildlife and native plants for foods and other products.

Shortly after abandonment of the Verde Valley by the Sinagua, groups of foragers and hunters reappeared. Around 1500 A.D., the Yavapai occupied the valley and the Apache lived in the mountains to the east. They, too, were farmers, hunters, and foragers.

In 1582, an expedition led by Spanish explorer Antonia de Espejo left the Hopi mesas on the trail to the copper mines. When in the Verde Valley, they found a group of Yavapai mining and trading the green and blue pigments (near the present town of Jerome). In 1598, 1604, and 1776, other Spanish explorers and padres visited the valley and wrote about the inhabitants and their cultural and economic systems.

The earliest Anglo explorers and trappers used the Verde as a trail stop for many years, but not until the 1850s and 1860s did settlers begin to stay in the valley. The Yavapai were placed under military control in 1875 and moved to the San Carlos reservation. In 1900 they were returned to the valley at the Camp Verde reservation.

Montezuma Castle and Well have become increasingly well known and popular park units. This, coupled with efforts by the state to enhance tourism in Arizona, has led to significant increases in visitation. Below are figures that show visitation changes for the past twenty years:

#### Visitation

| <u>Year</u> | <u>Montezuma Castle</u> | <u>Montezuma Well</u> |
|-------------|-------------------------|-----------------------|
| 1968        | 253,008                 | 72,573                |
| 1978        | 398,578                 | 114,607               |
| 1988        | 708,093                 | 195,739               |

#### Natural Environment

The 1975 Master Plan and 1985 Statement for Management both state the purpose of Montezuma Castle and Montezuma Well is to preserve and interpret the prehistoric features and related natural environment of the area in a way that will enable the public to better understand and appreciate this ethnic heritage. While preservation of cultural resources was the impetus to create the monument, the importance of the natural setting was recognized as an integral part in the life of prehistoric and historic peoples. The early residents were attracted to the natural communities in the riparian area and adjacent uplands. The water, flora, and fauna resources created a productive environment for farming, gathering, and hunting. The geological formations, sculpted by erosion, provided not only materials to build houses, but also the alcoves for the cliff dwellings. Maintaining the natural environment is crucial to the cultural setting of the monument.

The two units of the monument lie six miles apart along the meandering channel of Beaver Creek, which is a tributary of the Verde River. The Castle unit contains 580.38 acres located along Beaver Creek. It includes the creek bottom, the sheer limestone cliff where the ruin is located, and an area of small hills north of the cliff. The Well unit is upstream along Wet Beaver Creek and contains 278.17 acres. It includes the creek bottom and a large flat-topped hill that contains the sink known as Montezuma Well. The denser, riparian vegetation along the creek bottom provides an oasis in the semiarid landscape surrounding the monument.

The climate is semiarid with mild winters and hot summers. Annual precipitation averages 11 inches.

The geology of the Verde River Valley is a long depression sunk by earthquake actions along several faults below the level of the Coconino Plateau. The middle Verde, where the monument is located, flows through a broad valley approximately 35 miles

ling. About 10 million years ago, large scale volcanic activity blocked the river's outlet and formed a huge lake. Deposition of sandstone and limestone on the lake bottom continued for thousands of years until the river cut a new outlet and exposed the broad middle Verde Valley. Many of the monument structures are located in alcoves in the limestone deposits. The Well is a limestone sink.

This area is topographically diverse with terrain including valleys, mesas, canyons, plateaus, and peaks. There is a large area of flat, fertile land along the creeks in the monument. Parts were farmed intermittently starting with the Sinagua since around 600 to 800 A.D. Farming was interrupted with their departure but was initiated again by European settlers in the 1800's.

Increased land and water use patterns in the Verde Valley indicate that water rights, water quality, aquifer protection, floodplain regulation, instream mining, instream flow, riparian habitats, wildlife and endangered species are among the concerns to park management. A water resources management plan is being prepared to identify and help address problems such as those listed below.

Surface and ground water resources create and sustain aquatic and riparian ecosystems in the monuments and supported prehistoric and historic land occupation and uses. Riparian and aquatic environments have become increasingly important in the arid southwest due to widespread destruction and/or significant alteration. They are highly productive ecosystems that have been greatly reduced in areal extent and complexity by ground water overdrafts, overgrazing, streambed channelization, surface water flow alterations, impoundments, mining, and developments. These uses often conflict with protection and preservation of natural and cultural resources.

The importance of groundwater in the area is significant. About half the flow of the Verde River leaving the valley is due to groundwater discharge into the river and its tributaries. Most occurs as non-point discharge into streams along their courses. Another portion results from springs, such as Montezuma Well, which discharges approximately 1000 gpm. Adjacent land uses pose a threat to groundwater in the monument. Rapid urbanization in the Verde Valley has led to increased number of wells drilled for water supplies. The population of the locality is predicted to increase substantially.

Groundwater and spring discharges result in perennial flow in the river and some of its tributaries. However, human uses often interrupt the natural regime of surface waters. Part or all of the flow for Beaver Creek is diverted for irrigation during the

summer. This upstream use affects the amount of creek water flowing through Montezuma Well and Montezuma Castle.

Water rights to surface water in the Verde River as well as groundwater are currently being adjudicated. The NPS claims for the monument include "All surface and ground water resources including creeks, springs, seeps and confined and unconfined aquifers within portions of the unit reserved or withdrawn from public domain and continuously administered by Federal agencies. This includes Beaver Creek and its unnamed tributaries." The claim for the reserved rights at Montezuma Castle includes consumptive and non-consumptive uses of all groundwater wells and surface waters. For Montezuma Well, two groundwater wells and the prehistoric/historic irrigation ditch are included in the claim. Half of the discharge from the Well is claimed. Water rights here are appropriative and reserved.

Lack of data about the biological resources is a critical resources problem. The few studies and inventories done provide some information to manage resources, but much more is needed for comprehensive understanding of the environment and inter-relationships.

The juxtaposition of upland and lowland habitats dissected by floodplains produce unique and diverse biological communities. This area is one of the most significant bioregions of Arizona. Five plant associations occur in the monument and include the snakeweed-honey mesquite association, creosote bush-crucifixion thorn association, mixed deciduous association, honey mesquite association, and pondweed association.

The diversity of aquatic and terrestrial in the habitats are also notable. Birds are the most commonly observed wildlife, and breeding densities in undisturbed riparian habitats are reported as being among the highest recorded from North America. Other fauna include the coyote, fox, bat, bobcat, mountain lion, ground squirrels, and other common rodents. Reptiles include several snakes and lizards. The Well is habitat for unique invertebrates known only from that location.

A few sensitive species are found in the monument or have potential habitat. They include the Arizona cliffrose (endangered) for which habitat exists, an amphipod in the Well (category 2), and the southern bald eagle (endangered) nests in the area. Some endangered fish species, the razorback sucker and Colorado squawfish have been reintroduced into the Verde River. The endangered spikedace occurs in part of the Verde River.

## Management Objectives

The management objectives regarding cultural and natural resources are listed below:

- Preserve and protect prehistoric and historic structures and objects.
- Manage the collection of cultural objects so they do not deteriorate.
- Restore and/or perpetuate the cultural landscape.
- Preserve ecological processes in a manner to perpetuate native species and suppress alien species.
- Preserve water rights and protect water resources.
- Gather data through research programs in archeology, history, natural science, visitor use, and land use.
- Monitor cultural and natural resources to detect change.
- Cooperate and plan with government agencies and community groups to protect the integrity of the cultural and natural environment within and surrounding the monument.

This Natural and Cultural Resources Management Plan is a revision of the original 1975 plan, including environmental assessment, and the subsequent updates in 1981, 1984, 1985, and 1987. In developing this current plan, an interdisciplinary approach was used with a team of cultural and natural resources managers and scientists. As a result, the program was enhanced. There was an increase from seven projects in the original plan to over 50 resources projects in this one.

This plan, as with the previous documents, guides the resources management program at Montezuma Castle National Monument in accordance with the above mentioned objectives. Through the plan, resources issues are identified and actions are proposed to deal with problems and threats or else to conduct research in order to gather information for management.

This Resources Management Plan (like its predecessors) was prepared in conjunction with other park documents in order to be consistent with the purpose for establishment and with operational plans. It also complies with environmental and cultural legislation.

## PRESENT RESOURCE STATUS

### Natural Resources Baseline Information

The National Park Service is currently developing Servicewide "Standards for Natural Resources Inventory and Monitoring" which, when available, will be helpful in more uniformly describing information in this section. In the meantime, the status of Montezuma Castle National Monument's resource information base is thoroughly inadequate for the job at hand. The major focus of the natural resources section of this Resources Management Plan is the development of an adequate baseline data base for the Monument.

Some baseline information does exist for Montezuma Castle, but the level of information in past and current studies is simply inadequate to gather complete knowledge of resources to guide proper management over the long run. Consequently, most of the natural resources project statements listed within this Natural and Cultural Resources Management Plan are designed to provide baseline data for the monument.

Currently, the natural resources data base is comprised of the following information:

1. An inventory of plants primarily resulting from a specific survey published in 1960. In addition, partial plant lists have been generated from surveys and scientific studies, such as mapping of trees and major shrubs in the riparian zone, aquatic vertebrate studies in the Well, water resources planning, and vegetation inventory, classification, and mapping.
2. For several years, studies have been done on aquatic plant and invertebrate species in Montezuma Well, resulting in the discovery of unique species and habitat. Associated coring and radiocarbon dating of the bottom sediment showed prehistoric vegetation and aquatic environment.
3. Geological studies have been conducted for Montezuma Well and cave.
4. An autecology of sycamore and preparation of a base map of the Castle riparian zone. This literature search was done to provide management with basic information about an important tree species in the monument that contributes significantly to the aesthetic environment around the Castle. The management question was what was needed to maintain the gallery forest of sycamores.

5. A 1931 inventory map was done of trees and major shrubs in the riparian zone along Wet Beaver Creek and Beaver Creek from Montezuma Well to Montezuma Castle. In 1988, a study was contracted for another inventory and mapping of the Castle vicinity. This will show changes over time in the vegetation and help managers identify problems and techniques to maintain the sycamore-dominated gallery forest.

6. Low level air photographs were taken of all units at a scale of 1" = 200'. These have proven invaluable for discussion, planning, and illustration of park concerns.

7. A vegetation study was contracted for the entire monument to do vegetation inventory, classification, and mapping in 1987. Permanent plots were established for long termed monitoring, and historic photos were retaken. The report included impacts and changes of vegetation communities due to human influences, such as grazing, fire, agriculture, and visitation.

8. In preparation for writing a water resources plan, a contract was let to gather information about water resources for the monument. It summarized historical data and research as well as identified water resources related issues. The report will be put with project statements to form the final water resources plan.

9. Subsequent to the vegetation study for the entire monument, another one was contracted to more thoroughly examine the wall of Montezuma Well. This was started in 1988 and entailed vegetation inventory, classification, and mapping. Permanent plots will be established for long termed monitoring, and historic photos will be retaken. The report will also include impacts and changes of vegetation communities due to human influences.

### Natural Resources

The natural environment in this rich riparian area and adjacent uplands provided shelter and sustenance as well as an aesthetic setting for the Sinagua and Hohokam people. Because the geological forms and biotic components are integral features of the cultural resources, the monument is dedicated to maintaining the landscape that attracted the early residents. To that end, it is essential to protect and preserve the ecological processes that created the cultural setting.

Although severe deterioration of the monument's natural resources is not currently evident, there are some human activities that do pose a threat to these resources. These activities are briefly discussed below and are the subject of several project statements in this plan.

The four most serious known threats are:

Lack of basic resource data--There is an insufficient understanding of park ecosystems and threats to them, as noted in the previous section on natural resources baseline information. This makes it difficult to properly assess the condition of resources or identify threats. In a very real sense, this lack of data represents a threat of its own. It renders it difficult for the superintendent to make well reasoned decisions on how to properly manage the resources.

Groundwater withdrawal--Montezuma Well could dry up or become polluted as the result of increased land development when more wells are drilled and septic tanks are installed. Although no evidence is currently available showing a drop in the water table, the Verde Valley is one of the fastest growing areas in Arizona. The potential is great for a problem in the future.

Alteration of natural flow regimes--Water diversion, gravel mining, and other human manipulations in the Beaver Creek watershed can cause down cutting or deposition in the channel, flooding, or change of flow regime. Most or all of perennial Beaver Creek is diverted for irrigation during the summer months each year. Such activities pose a serious threat to the integrity of native ecosystems.

Adjacent land uses--As stated earlier, the Verde Valley is one of the fastest growing areas in Arizona. Increasing development on lands adjacent to and surrounding the monument results in direct and indirect impacts, i.e., mining, feral animals, woodcutting, freeway, subdivisions, water demands, and visual intrusions to the cultural and natural setting.

Other important issues facing the monument include:

Lack of secure water rights--The monument's water rights are presently under adjudication. In addition, the existing system for monitoring delivery of water to parties having rights thereto is inadequately installed. The result is a poor data set and possibly inappropriate apportionment of available water.

Visitor use impacts--Enhanced notoriety and popularity has resulted in increased visitation. The physical and social human impacts cause a strain on the monument's natural and cultural resources, facilities, and the quality of the visitor experience.

Non-native species invasion--Non-native species accompanying human occupation have invaded the monument with varying degrees of impact to native fauna and flora as well as the visiting public and employees.

Vegetation management--Protection of prehistoric landscapes, preservation of native vegetation such as the Arizona sycamores, landscaping around buildings and facilities, and hazard tree management all require careful attention on the part of the monument staff.

Management of prehistoric fields--Options are being explored for managing the open fields once cultivated by the prehistoric Sinaguan inhabitants.

Flood Hazards--An assessment of flood hazards and possible means to minimize potential loss of life and property is needed.

### Cultural Resource Baseline Information

Baseline information for the monument is lacking in a number of areas. A list of these deficiencies is as follows: 1) basic information on the ruins and artifacts prior to Service acquisition in 1906; 2) analysis of records and artifacts from the site; 3) cataloging of backlogged museum objects for basic federal property accountability; 4) Historic and Prehistoric Structures Preservation Guides; 5) administrative history for the area established in 1906; 6) entry of studies into the Cultural Resource Management Bibliography (CRBIB); 7) updating of the List of Classified Structures (LCS); 8) updating of museum records for objects into the computer program; 9) basic information on the prehistoric irrigation system at Montezuma Well; 10) research to determine the construction and occupation periods for Montezuma Castle; and 11) entry of sites into the Cultural Sites Inventory (CSI), once Servicewide standards have been established for such data entries.

The following sections of this plan provide more specific details on cultural resource needs for the monument: 1) project statements, which provide additional information on needed actions; 2) Appendix 2, Cultural Resources Documentation Checklist, which provides a summary of completed cultural resources related studies in the monument; and 3) Appendix, Bibliography, which contains a list of references of studies and projects conducted in the monument.

### Cultural Resources

Sites. The majority of the sites at Montezuma Castle National Monument are nationally significant and prehistoric in origin. The monument has had a 100% survey to identify cultural resources. Sixty-five prehistoric archeological sites have been recorded within the monument, ranging from early pithouse villages to protohistoric Apache camps. The sites within the Monument are the best documented cluster in the middle Verde.

Monument resources are available to interpret the growth of pithouse villages, the transformation to masonry pueblos, the growth of pueblo community systems, and abandonment of the valley. Irrigation systems and broad interregional trade and interaction are also important elements of interpretation here.

Structures. The majority of the structures in Montezuma Castle National Monument are prehistoric and are at the national level of significance. These structures are the primary resource for which the area was established. With the exception of the pithouse, which receives moderate impact as a result of unintentional vandalism, the prehistoric structures in the monument experience relatively low impact.

There are three remaining historic structures in the monument which have not been placed on the National Register and have as yet undetermined significance. Two of the structures, the adobe residences at Montezuma Castle, are in good condition, receiving low impact from occupants. The third historic structure is the 1874 log cabin (smokehouse), which is in poor condition due to severe impacts from animal/pest infestations and weathering. The structure remains standing, though there is little left of the supporting log walls. The documentation level for this structure is poor and this has hindered progress toward National Register nomination.

Both Montezuma Castle and Montezuma Well have been completely surveyed for potential National Register structures. The monument's List of Classified Structures represents a complete inventory of all structures that are either on the National Register or which the Western Regional Office considers eligible for the National Register.

Objects. The Montezuma Castle National Monument collections are primarily comprised of archeological material recovered from excavating the ruins. These collections are either on exhibit in the park museum (about 140 items) or stored and curated at the Museum Collections Repository, Western Archeological and Conservation Center (MCR - WACC), Tucson, Arizona. There are a small number of other types of objects in the collection including ethnographic, historic, and biological specimens (please refer to the summary chart for objects, Appendix 1, for exact numbers).

The MCR - WACC has recently completed cataloging all material, and basically, the collections are in good condition. The Montezuma Castle museum is in need of climate controls and further security systems in order to protect artifacts to NPS standards. The monument acquires curatorial items at a very slow rate; only three items have been acquired over the last three years. Therefore, no future cataloging backlog is expected.

## Cultural Context/Theme

In the thematic analysis, History and Prehistory in the National Park System and the National Historic Landmarks Program (1987), Montezuma Castle represents:

- I. CULTURAL DEVELOPMENTS: INDIGENOUS AMERICAN POPULATIONS
  - B. Post-Archaic and Pre-Contact Developments
    - 8. Southwestern Farmers
  - C. Prehistoric Archeology: Topical Facets
    - 1. Prehistoric Architecture
    - 2. Prehistoric Technology
    - 3. Prehistoric Social and Political Organization
    - 5. Prehistoric Arts/Handicrafts
    - 8. Prehistoric Economics/Trade
    - 12. Prehistoric Settlements and Settlement Patterns
    - 16. Prehistoric Horticulture
    - 18. Prehistoric Demographics
    - 19. Prehistoric Cultural Change

The USFS is currently updating their Archeological Context Study of the Verde Valley, and will include Montezuma Castle and new NPS data in their analysis.

In the period 1916-1942, there developed in western parks a style of architecture employing native materials to blend the structure into the environment which has been referred to as "rustic architecture", "Parkitecture" or "Architecture in the Parks". Rustic is a style which, through the use of native materials (in the particular park or area of the park) in proper scale, and through the avoidance of rigid straight lines and over-sophistication, gives the feeling of having been built by pioneer craftsmen with limited hand tools. It thus achieves sympathy with natural surroundings and with the past.

At Montezuma Castle, adobe residences 4 and 5, designed in the Pueblo style of rustic architecture are on the National Register of Historic Places. The Structures are of local significance in the fields of architecture and landscape architecture as quality examples of "environmental design". They were constructed in 1939 under a Public Works Program.

In the thematic analysis, History and Prehistory in the National Park System and the National Historic Landmarks Program (1987), Montezuma Castle represents:

- VII. AMERICA AT WORK (Theme)
  - E. Architecture (Sub-theme)
    - 6. Other Specialized-Rustic (Facet)

## NATURAL AND CULTURAL RESOURCES MANAGEMENT PROGRAM

### Overview of Current Program and Needs

Since the Castle and Well units have both had complete archeological inventories, and interpretation will continue to focus on the same sites and objects now on exhibit, the primary cultural resource program needs are to maintain these objects and sites. In addition, collection and assessment of existing records and data is needed to provide background for management and interpretation of the archeology and history of the monument.

A continuous need is the stabilization of sites on exhibit, including Montezuma Castle, surface pueblos along the trails, and an excavated pit house at Montezuma Well. Although the Castle is in excellent preservation, and has been closed to the public since 1951, its condition still requires periodic monitoring; any significant deterioration could result in its collapse from its perch in the cliff. An important source of data on the condition of the castle as it has appeared over the last century is historic photographs, many of which are in private collections or institutions; an inventory of these photographs is needed (C23). Small pueblos with standing walls at the Castle and Well are stable, but are subject to impact from visitation. The Hohokam-type pit house at the Well unit, the only structure of its kind on display in the Service, needs special attention; its floor was coated with a polymer amended mud after excavation, over 30 years ago. This coating is cracking and deteriorating, detracting from the authenticity of appearance. It is important that a specialist in historic structure maintenance inspect the ruins at regular intervals, prepare historic preservation guides, and establish a regular schedule for stabilization and repair (See project statements C-01, C-16, C-17, C-19).

The monument has a significant and very valuable collection of artifacts on display, which interpret both prehistoric and historic Native American cultures of the area. These are presently in exhibit cases that cannot be continuously monitored, and which could be easily burglarized. New security measures are required for their protection (C-02). The fluctuation of temperature and humidity in the existing visitor center has real potential for harm to some unique artifacts made from organic material, and needs to be controlled by modification or replacement of the existing exhibit space (C-03). In addition to the approximately 140 items at the monument, the Western Archeological and Conservation Center stores over 5000 artifacts from the monument. Planning storage, treatment and security of these objects requires a Collection Management Plan (C-13). Since Montezuma Castle was excavated by archeologists and amateurs prior to establishment of the monument, there are probably more objects in private and institutional collections

than there are stored by the Service. The location and extent of the collections have never been determined; a survey and inventory of them would provide valuable data for future research and interpretation (C-07).

Site records, reference bibliography and interpretive context for the prehistoric and ethnographic resources of the monument have been periodically revised, but need to be updated for ready use in interpretation, management and research. Archeological site records have yet to be entered in the national computerized Cultural Sites Inventory (C-10). An archeological overview and annotated bibliography were prepared in 1977; since then research on the Sinagua and Hohokam has been accomplished within the monument and in nearby areas, which can add to interpretation. These should be incorporated in a revised overview and bibliography (C-08, C-12).

Two research topics have the potential to contribute to interpretation of the prehistoric resources. While it is presumed that irrigation systems were essential to the prehistoric settlement in and around the monument, little is actually known about the extent and nature of the irrigation canal network at Montezuma Well. Mapping and excavation of the canal segments should provide valuable new information on these subjects (C-06). Another important question is the age of Montezuma Castle itself. It is assumed that the Castle belongs to the Tuzigoot Phase (AD 1200-1400), but there is no direct evidence for this. There is no collection of datable pottery from the cliff dwelling, and none of the well-preserved wooden beams in the structure are datable by tree-rings. A series of dates from small samples taken from the wooden beams, using C14 accelerator dating, should bracket the age of the structure (C-11).

Some historic research can contribute to management of the monument's cultural resources. The last administrative history was written in 1965; documenting activities at the monument since then in an Administrative History (C-05) would provide general historical data, as well as an assessment of the historic smokehouse at Montezuma Well. If it is determined that this structure qualifies for the National Register, an Historic Structure Preservation Guide for it and two historic buildings used as residences should be prepared (C-15), following which a systematic program of structures maintenance should be carried out (C-20).

Montezuma Castle National Monument has a small staff, with no single position having full-time responsibility for either cultural or natural resources planning or protection. Current staffing levels are sufficient to allow for the continuance of minimum levels of natural resource protection through such activities as pest management (N-01), tree hazard removal and

other vegetation management activities (N-02), program administration (I-01), and the preparation of a management plan for prehistoric Sinaguan fields (I-02).

Cultural resources management being conducted with current staffing levels includes such activities as conserving museum objects (C-01), museum collection management (C-02), maintaining ANCS program (C-03), and program administration (I-01). These activities are routinely carried out on a recurring basis to protect cultural resources from depreciative activities.

Montezuma Castle receives cyclical preservation assistance from the Ruins Preservation Specialist of the Southern Arizona Group Office. The Western Archeological and Conservation Center provides assistance in curation of museum objects and assistance in archeological site management. The Cooperative Park Studies Unit at the University of Arizona provides assistance with natural resources research issues. The Southern Arizona Group Office provides natural resources management and planning assistance. Almost all of this assistance, however, is predicated on project specific funding rather than on base funded activities.

None of the major threats to the monument's natural resources are currently being addressed, due to a lack of adequate staffing and associated project funds. Similar restrictions inhibit the cultural resource management efforts in the monument. The only activity currently underway which is beyond the scope of the basic ongoing program is the development of management options for the Sinaguan prehistoric fields. This effort is a pressing concern, due to the eminent expiration of a grazing lease and the need to determine the most appropriate use of these fields.

The breadth and complexity of the cultural and natural resource issues at Montezuma Castle and Tuzigoot National Monuments demand the attention of a professional resource manager. A full-time resources management specialist could be shared between the two monuments (I-03). In addition, at least \$30,000 per year in project support funds is needed by Montezuma Castle National Monument to carry out the baseline research and management activities listed in this plan within a reasonable period of time. Even with funding of \$30,000 per year, it would take Montezuma Castle ten years to complete their six highest priority natural resource projects (out of 26 unfunded natural projects identified to date) and five of their six highest cultural projects (out of 18 unfunded cultural projects identified to date). This excludes rebuilding the museum, which would require \$350,000 in itself.

An indication of the resource funding shortage at the monument is provided by the fact that the total project funding for both cultural and natural resources programs in the last five years at

Montezuma Castle has been only about \$55,000. This funding has come entirely from cultural cyclic maintenance, natural resource regional rotating base funds, cultural resource preservation funds, and fee enhancement funds. Increased base funding is needed by the monument to adequately do the job at hand.

(Tables 1 and 2 show the levels of funding and personnel currently available for cultural and natural resources management activities in the monument.)

When funding becomes available the monument will undertake the following long-term strategies to address the major resource threats to the monument's natural resources outlined in the Present Resource Status section of this plan:

Lack of basic resource data--An interdisciplinary team of experts was convened in July 1988 to identify the range of resource components that need to be studied. The interdisciplinary group recommended that the selected components be inventoried, the status of each component be assessed, a long-term monitoring protocol be developed to track health of the ecosystem over time, the monument staff be trained to use the monitoring protocol, and that long-term monitoring be conducted by the monument staff. Once a series of these inventory and assessment projects have been completed it will be necessary to integrate the individual protocols into a unified long-term monitoring program for the monument.

Further, it was recommended that the monument use a Geographic Information System (GIS) to manage the inventory and monitoring data (N-25). The GIS themes should be developed prior to the inventory and assessment projects to ensure that all data is gathered in a format compatible with GIS requirements and consistent with anticipated analysis needs. The actual digitization of data and any purchase of GIS hardware can occur at a later date, as needed.

These recommendations have been developed into a series of project statements in the following priority order:

- N-04 Identify and Inventory Water-Related Resource Attributes
- N-07 Inventory Natural Resources of Montezuma Well & Environs
- N-09 Conduct Riparian Ecosystem Research
- N-11 Delineate and Evaluate Strategies for Wetlands Protection
- N-12 Analyze Hydrologic Characteristics at Montezuma Well
- N-15 Conduct Inventory & Assessment: Vegetation & Flora
- N-16 Conduct Inventory & Assessment: Invertebrates
- N-17 Conduct Inventory & Assessment: Amphibians and Reptiles
- N-18 Conduct Inventory & Assessment: Birds
- N-19 Conduct Inventory & Assessment: Soils
- N-20 Conduct Inventory & Assessment: Mammals

TABLE 1  
NPS RESOURCES PERSONNEL  
(current year only)

FY: 90  
PARK: MOCA  
REGION: WR

| TYPE OF NPS EMPLOYEE                                                                             |                                                | FTE's of RESOURCES WORK |          |       |
|--------------------------------------------------------------------------------------------------|------------------------------------------------|-------------------------|----------|-------|
|                                                                                                  |                                                | Natural                 | Cultural | Total |
| RESEARCH SCIENTISTS (i.e., Research Grade Evaluation and Research Grant Administration Programs) |                                                | 0                       | 0        | 0     |
| RESOURCES SPECIALISTS (i.e. 170, 190, 193, 401, 404, 430, 808, 1015, 1016, 1215, etc.)           |                                                | 0                       | 0        | 0     |
| 025 PARK RANGERS - Resource Management                                                           |                                                | 0.55                    | 0.53     | 1.08  |
| 025 PARK RANGERS - Resource Protection                                                           |                                                | 0                       | 0        | 0     |
| 025 PARK RANGERS - Resource Interpretation                                                       |                                                | 0                       | 0        | 0     |
| MAINTENANCE PERSONNEL                                                                            |                                                | 0                       | 0        | 0     |
| TOTALS OF ALL RESOURCES PERSONNEL                                                                |                                                | 0.55                    | 0.53     | 1.08  |
| TOTAL PARK FTE<br>(ALL PERSONNEL) 18                                                             | PERCENTAGE OF PARK FTE<br>DEVOTED TO RESOURCES | 3.1%                    | 2.9%     | 6.0%  |

TABLE 2  
CURRENT YEAR NATURAL AND CULTURAL RESOURCES FUNDING  
(\$ in thousands - funding by activity type)

FY: 90  
PARK: MOCA  
REGION: WR

| FUNDING<br>SOURCE | TOTAL  | RESEARCH/<br>DOCUMEN-<br>TATION | MITIGA-<br>TION/<br>TREATMENT | MONITOR-<br>ING | PROTECTION | INTERPRE-<br>TATION | PROGRAM<br>ADMIN/<br>TRAINING |
|-------------------|--------|---------------------------------|-------------------------------|-----------------|------------|---------------------|-------------------------------|
| CF2               | \$15.0 | 0                               | \$5.9                         | 0               | 0          | 0                   | \$ 9.1                        |
| NF2               | \$15.8 | 0                               | \$5.0                         | \$1.0           | 0          | 0                   | \$ 9.8                        |
| NF3               | \$ 3.0 | 0                               | 0                             | 0               | 0          | 0                   | \$ 3.0                        |
| NF8               | \$ 2.0 | 0                               | 0                             | \$2.0           | 0          | 0                   | 0                             |
| ALL SOURCES       | \$35.8 | 0                               | \$10.9                        | \$3.0           | 0          | 0                   | \$21.9                        |

- N-25 Develop Geographic Information System
- N-26 Conduct Inventory & Assessment: Fishes
- I-04 Develop Bibliographic Assessment & Computer Retrieval System
- I-05 Integrate Program for Long-Term Monitoring of Cultural and Natural Resources

Groundwater withdrawal--Experts from the National Park Service Water Resources Division (WRD) met with the interdisciplinary team mentioned above and helped develop a strategy for protecting the monument's groundwater resources. First, a broad-based inventory of water-related resource attributes throughout the monument will be conducted (N-04), followed by a more intense basic natural resources inventory of Montezuma Well and the adjacent riparian and terrestrial habitat (N-07). The data already gathered on the hydrologic characteristics of the archaeological and historical setting at Montezuma Well will also be analyzed (N-12). Aquatic organisms and their habitat requirements will then be researched (N-08) as well as the delineation and evaluation of strategies for wetlands protection (N-11). These projects, in conjunction with the associated long-term monitoring, will enable the monument to better understand the consequences of additional groundwater withdrawal in the area and to work effectively with other agencies, groups, and individuals to minimize adverse impacts on monument resources.

Alteration of flow regimes--The National Park Service Water Resources Division staff also assisted in developing a strategy for protecting monument resources from altered flow regimes. Again, the initial step will be the broad inventory of water-related resource attributes throughout the monument (N-04). Next, more intensive research will be conducted to better understand the monument's riparian ecosystem (N-09), followed by the delineation and evaluation of strategies for wetlands protection (N-11). Then, research on the effects of hydrologic characteristics on the morphological properties of flowing streams (N-23) and on the regeneration of vegetation in riparian areas (N-24) will be conducted. Again, these projects, in conjunction with the associated long-term monitoring, will enable the monument to better understand the impact of the alteration of flow regimes and to work effectively with other agencies, groups, and individuals to minimize adverse impacts on monument resources.

Adjacent land use--A project statement (N-06) has been designed to identify the issues, concerns, and opportunities presented by rapid changes in adjacent land use; analyze the management situation and assess the risk level associated with these land use changes; develop a monitoring protocol to track changes; and train monument staff to conduct the monitoring. Once again, this will prepare monument staff to work effectively with others to minimize any adverse impacts of adjacent land use on monument resources.

The other important natural resource issues identified in the Present Resource Status section will be addressed by the following project statements as funding becomes available:

Lack of secure water rights:

MOCA-N-05 Evaluate Water Delivery Monitoring System

Visitor use impacts:

MOCA-N-10 Conduct Visitor Use Survey

MOCA-N-14 Determine Visitor Impacts and Use Limits

Non-native species invasion:

MOCA-N-21 Conduct inventory and Assessment: Non-native Species

Vegetation management:

MOCA-N-02 Manage Vegetation: Rehab, Landscaping, & Tree Hazard Removal

Management of prehistoric fields:

MOCA-I-02 Prepare Management Plan for Prehistoric Sinaguan Fields

MOCA-N-22 Examine Old Fields

Flood Hazards:

MOCA-N-13 Identify Flood-Prone Areas to Protect Lives and Property

Natural, Cultural, and Integrated Resources Projects Programming  
Sheets

The following tables show the currently funded and ongoing natural, cultural, and integrated resources projects in the monument, as well as priority listings of unfunded needs for all three subject areas.

PROGRAMMING SHEET 1  
CURRENT YEAR FUNDED NATURAL RESOURCES ACTIVITIES  
(\$ in thousands)

FY: 90  
Park: MOCA  
Region: WESTERN

| PROJ<br>STMT<br>NUM                               | PROJECT OR ACTIVITY<br>TITLE                                                    | PKG<br>NUM | CULT<br>RES<br>TYPE | SERVICE-<br>WIDE<br>ISSUE(S) | FUNDING<br>SOURCE | ACT<br>TYPE | CURRENT<br>YEAR |     | OUTYEAR 1 |     | OUTYEAR 2 |     | OUTYEAR 3 |     | TOTAL |      |
|---------------------------------------------------|---------------------------------------------------------------------------------|------------|---------------------|------------------------------|-------------------|-------------|-----------------|-----|-----------|-----|-----------|-----|-----------|-----|-------|------|
|                                                   |                                                                                 |            |                     |                              |                   |             | \$\$            | FTE | \$\$      | FTE | \$\$      | FTE | \$\$      | FTE | \$\$  | FTE  |
| N-01                                              | Manage Pest Species                                                             | N/A        | N/A                 | N05                          | NF2               | MIT         | 3.0             | .12 | 3.0       | .12 | 3.0       | .12 | 3.0       | .12 | 12.0  | .48  |
| N-02                                              | Manage Vegetation: Rehab-<br>ilitation, Landscaping,<br>and Hazard Tree Removal | N/A        | N/A                 | N22                          | NF2               | MIT         | 2.0             | .1  | 2.0       | .1  | 2.0       | .1  | 2.0       | .1  | 8.0   | .40  |
| N-03                                              | Outflow Measurements<br>for Montezuma Well                                      | N/A        | N/A                 | N12                          | NF2               | Mon         | 1.0             | .05 | 1.0       | .05 | 1.0       | .05 | 1.0       | .05 | 4.0   | .20  |
|                                                   |                                                                                 |            |                     |                              | NF8               | Mon         | 2.0             | 0   | 2.0       | 0   | 2.0       | 0   | 2.0       | 0   | 8.0   | 0    |
| TOTAL FOR ALL FUNDED NATURAL RESOURCES ACTIVITIES |                                                                                 |            |                     |                              |                   |             | 8.0             | .27 | 8.0       | .27 | 8.0       | .27 | 8.0       | .27 | 32.0  | 1.08 |

PROGRAMMING SHEET 2  
 UNFUNDED NATURAL RESOURCES ACTIVITIES  
 (\$ in thousands)

FY: 90  
 Park: MOCA  
 Region: WESTERN

| PK<br>PRI<br>NUM | PROJ<br>STATM<br>NUM | PROJECT OR ACTIVITY<br>TITLE                                                                                         | PKG<br>NUM | CULT<br>RES<br>TYPE | SERVICE-<br>WIDE<br>ISSUE(S) | FUNDING<br>SOURCE | ACT<br>TYPE | STARTING<br>YEAR |     | OUTYEAR 1 |     | OUTYEAR 2 |     | OUTYEAR 3 |     | TOTAL |     |
|------------------|----------------------|----------------------------------------------------------------------------------------------------------------------|------------|---------------------|------------------------------|-------------------|-------------|------------------|-----|-----------|-----|-----------|-----|-----------|-----|-------|-----|
|                  |                      |                                                                                                                      |            |                     |                              |                   |             | \$\$             | FTE | \$\$      | FTE | \$\$      | FTE | \$\$      | FTE | \$\$  | FTE |
| 1                | I-03                 | Increase Natural<br>and Cultural<br>Resources Manage-<br>ment Staffing                                               | N/A        | N/A                 | N24                          | NF1               | MIT         | 60.0             | 1.0 | 60.0      | 1.0 | 60.0      | 1.0 | 60.0      | 1.0 | 240.0 | 4.0 |
| 2                | I-04                 | Develop Biblio-<br>graphic Assessment<br>and Computerized<br>Bibliographic Infor-<br>mation Retrieval<br>System      | N/A        | N/A                 | N20                          | NF3               | RES         | 11.6             | 0.2 | 0         | 0   | 0         | 0   | 0         | 0   | 11.6  | 0.2 |
| 3                | N-04                 | Identify and Invent-<br>tory Water Related<br>Resources                                                              | N/A        | N/A                 | N20                          | NF8               | RES         | 20.0             | 0   | 0         | 0   | 0         | 0   | 0         | 0   | 20.0  | 0   |
| 4                | N-05                 | Evaluate Water<br>Delivery Monitoring<br>System                                                                      | N/A        | N/A                 | N13                          | NF8               | RES         | 10.0             | 0   | 0         | 0   | 0         | 0   | 0         | 0   | 10.0  | 0   |
| 5                | N-06                 | Analysis of Adjacent<br>Land Use and Status                                                                          | N/A        | N/A                 | N16                          | NF3               | RES         | 30.0             | 0   | 0         | 0   | 0         | 0   | 0         | 0   | 30.0  | 0   |
| 6                | N-07                 | Inventory the Basic<br>Natural Resources of<br>Montezuma Well and<br>Adjacent Riparian<br>and Terrestrial<br>Habitat | N/A        | N/A                 | N20                          | NF3               | RES         | 22.0             | 0.7 | 12.3      | 0.4 | 0         | 0   | 0         | 0   | 34.4  | 1.1 |

PROGRAMMING SHEET 2  
 UNFUNDED NATURAL RESOURCES ACTIVITIES  
 (\$ in thousands)

FY: 90  
 Park: MOCA  
 Region: WESTERN

| PK<br>PRI<br>NUM | PROJ<br>STATM<br>NUM | PROJECT OR ACTIVITY<br>TITLE                                                                     | PKG<br>NUM | CULT<br>RES<br>TYPE | SERVICE-<br>WIDE<br>ISSUE(S) | FUNDING<br>SOURCE | ACT<br>TYPE | STARTING<br>YEAR |     | OUTYEAR 1 |     | OUTYEAR 2 |     | OUTYEAR 3 |     | TOTAL |     |
|------------------|----------------------|--------------------------------------------------------------------------------------------------|------------|---------------------|------------------------------|-------------------|-------------|------------------|-----|-----------|-----|-----------|-----|-----------|-----|-------|-----|
|                  |                      |                                                                                                  |            |                     |                              |                   |             | \$\$             | FTE | \$\$      | FTE | \$\$      | FTE | \$\$      | FTE | \$\$  | FTE |
| 7                | N-08                 | Assess Habitat Requirements of Aquatic Organisms at Montezuma Well                               | N/A        | N/A                 | N20                          | NF3               | RES         | 25.0             | 0   | 22.0      | 0   | 18.0      | 0   | 0         | 0   | 65.0  | 0   |
| 8                | N-09                 | Conduct Riparian Ecosystem Research                                                              | N/A        | N/A                 | N12                          | NF3               | RES         | 10.0             | 0.2 | 10.0      | 0.2 | 15.0      | 0.4 | 15.0      | 0.4 | 50.0  | 1.2 |
| 9                | I-05                 | Integrate Program of Long-Term Monitoring for Cultural and Natural Resources                     | N/A        | N/A                 | N20                          | NF3               | RES         | 35.0             | 0   | 0         | 0   | 0         | 0   | 0         | 0   | 35.0  | 0   |
|                  |                      |                                                                                                  | N/A        | N/A                 | N20                          | NF1               | MON         | 0                | 0   | 8.5       | 0.2 | 8.5       | 0.2 | 8.5       | 0.2 | 25.5  | 0.6 |
| 10               | N-10                 | Conduct Visitor Use Survey                                                                       | N/A        | N/A                 | N22                          | NF3               | RES         | 11.8             | 0.2 | 0         | 0   | 0         | 0   | 0         | 0   | 11.8  | 0.2 |
| 11               | N-11                 | Delineate and Evaluate Strategies for Wetlands Protection                                        | N/A        | N/A                 | N12                          | NF8               | RES         | 15.0             | 0   | 0         | 0   | 0         | 0   | 0         | 0   | 15.0  | 0   |
| 12               | N-12                 | Protect Hydrologic Characteristics of the Archeological and Historical Setting at Montezuma Well | N/A        | N/A                 | N12                          | NF8               | RES         | 50.0             | 0   | 40.0      | 0   | 40.0      | 0   | 0         | 0   | 130.0 | 0   |

PROGRAMMING SHEET 2  
 UNFUNDED NATURAL RESOURCES ACTIVITIES  
 (\$ in thousands)

FY: 90  
 Park: MOCA  
 Region: WESTERN

| PK<br>PRI<br>NUM | PROJ<br>STATM<br>NUM | PROJECT OR ACTIVITY<br>TITLE                                             | PKG<br>NUM | CULT<br>RES<br>TYPE | SERVICE-<br>WIDE<br>ISSUE(S) | FUNDING<br>SOURCE | ACT<br>TYPE | STARTING<br>YEAR |      | OUTYEAR 1 |      | OUTYEAR 2 |      | OUTYEAR 3 |     | TOTAL |      |
|------------------|----------------------|--------------------------------------------------------------------------|------------|---------------------|------------------------------|-------------------|-------------|------------------|------|-----------|------|-----------|------|-----------|-----|-------|------|
|                  |                      |                                                                          |            |                     |                              |                   |             | \$\$             | FTE  | \$\$      | FTE  | \$\$      | FTE  | \$\$      | FTE | \$\$  | FTE  |
| 13               | N-13                 | Identify Flood<br>Prone Areas for<br>Protection of Lives<br>and Property | N/A        | N/A                 | N20                          | NF8               | RES         | 35.0             | 0    | 0         | 0    | 0         | 0    | 0         | 0   | 35.0  | 0    |
| 14               | N-14                 | Determine Visitor<br>Impacts and Use<br>Limits                           | N/A        | N/A                 | N22                          | NF3               | RES         | 10.8             | 0.2  | 0         | 0    | 0         | 0    | 0         | 0   | 10.8  | 0.2  |
| 15               | N-15                 | Conduct Inventory<br>and Assessment:<br>Vegetation and Flora             | N/A        | N/A                 | N20                          | NF3               | RES         | 7.5              | 0.15 | 7.5       | 0.15 | 8.1       | 0.15 | 0         | 0   | 23.1  | 0.45 |
| 16               | N-16                 | Conduct Inventory<br>and Assessment:<br>Invertebrates                    | N/A        | N/A                 | N20                          | NF3               | RES         | 11.5             | 0.2  | 11.5      | 0.2  | 12.3      | 0.2  | 0         | 0   | 35.3  | 0.6  |
| 17               | N-17                 | Conduct Inventory<br>and Assessment:<br>Amphibians and<br>Reptiles       | N/A        | N/A                 | N20                          | NF3               | RES         | 8.8              | 0.1  | 8.8       | 0.1  | 8.8       | 0.1  | 0         | 0   | 26.4  | 0.3  |
| 18               | N-18                 | Conduct Inventory<br>and Assessment:<br>Birds                            | N/A        | N/A                 | N20                          | NF3               | RES         | 9.0              | 0.1  | 9.0       | 0.1  | 8.5       | 0.1  | 0         | 0   | 26.5  | 0.3  |
| 19               | N-19                 | Conduct a Survey<br>and Assessment of<br>Soils                           | N/A        | N/A                 | N20                          | NF3               | RES         | 13.9             | 0.2  | 0         | 0    | 0         | 0    | 0         | 0   | 13.9  | 0.2  |

PROGRAMMING SHEET 2  
UNFUNDED NATURAL RESOURCES ACTIVITIES  
(\$ in thousands)

FY: 90  
Park: MOCA  
Region: WESTERN

| PK<br>PRI<br>NUM                                    | PROJ<br>STATM<br>NUM | PROJECT OR ACTIVITY<br>TITLE                                                                                   | PKG<br>NUM | CULT<br>RES<br>TYPE | SERVICE-<br>WIDE<br>ISSUE(S) | FUNDING<br>SOURCE | ACT<br>TYPE | STARTING<br>YEAR |      | OUTYEAR 1 |      | OUTYEAR 2 |      | OUTYEAR 3 |     | TOTAL  |      |
|-----------------------------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------|------------|---------------------|------------------------------|-------------------|-------------|------------------|------|-----------|------|-----------|------|-----------|-----|--------|------|
|                                                     |                      |                                                                                                                |            |                     |                              |                   |             | \$\$             | FTE  | \$\$      | FTE  | \$\$      | FTE  | \$\$      | FTE | \$\$   | FTE  |
| 20                                                  | N-20                 | Conduct Inventory<br>and Assessment:<br>Mammals                                                                | N/A        | N/A                 | N20                          | NF3               | RES         | 8.3              | 0.1  | 8.3       | 0.1  | 8.3       | 0.1  | 0         | 0   | 24.9   | 0.30 |
| 21                                                  | N-21                 | Inventory, Assess,<br>and Evaluate<br>Control of Non-<br>Native Species                                        | N/A        | N/A                 | N20                          | NF3               | RES         | 14.0             | 0.3  | 14.8      | 0.3  | 0         | 0    | 0         | 0   | 28.8   | 0.6  |
| 22                                                  | N-22                 | Examine Old Fields                                                                                             | N/A        | N/A                 | N08                          | NF3               | RES         | 9.2              | 0.15 | 0         | 0    | 0         | 0    | 0         | 0   | 9.2    | 0.15 |
| 23                                                  | N-23                 | Evaluate Effects of<br>Hydrologic Character-<br>istics on Morpho-<br>logical Properties<br>of Flowing Streams  | N/A        | N/A                 | N12                          | NF8               | RES         | 30.0             | 0    | 10.0      | 0    | 0         | 0    | 0         | 0   | 40.0   | 0    |
| 24                                                  | N-24                 | Evaluate Effects of<br>Hydrologic Character-<br>istics on Regener-<br>ation of Vegetation<br>in Riparian Areas | N/A        | N/A                 | N12                          | NF8               | RES         | 35.0             | 0    | 20.0      | 0    | 20.0      | 0    | 0         | 0   | 75.0   | 0    |
| 25                                                  | N-25                 | Develop GIS System                                                                                             | N/A        | N/A                 | N20                          | NF3               | RES         | 9.5              | 0.2  | 18.9      | 0.2  | 13.0      | 0.2  | 0         | 0   | 41.4   | 0.6  |
| 26                                                  | N-26                 | Conduct Inventory<br>and Assessment:<br>Fishes                                                                 | N/A        | N/A                 | N20                          | NF3               | RES         | 8.3              | 0.1  | 8.2       | 0.1  | 0         | 0    | 0         | 0   | 16.5   | 0.2  |
| TOTAL FOR ALL UNFUNDED NATURAL RESOURCES ACTIVITIES |                      |                                                                                                                |            |                     |                              |                   |             | 511.2            | 4.1  | 269.8     | 3.05 | 220.5     | 2.45 | 83.5      | 1.6 | 1085.0 | 11.2 |

PROGRAMMING SHEET 1  
CURRENT YEAR FUNDED CULTURAL RESOURCES ACTIVITIES  
(\$ in thousands)

FY: 90  
Park: MOCA  
Region: WESTERN

| PROJ<br>STMT<br>NUM                                | PROJECT OR ACTIVITY<br>TITLE        | PKG<br>NUM | CULT<br>RES<br>TYPE | SERVICE-<br>WIDE<br>ISSUE(S) | FUNDING<br>SOURCE | ACT<br>TYPE | CURRENT<br>YEAR |     | OUTYEAR 1 |     | OUTYEAR 2 |     | OUTYEAR 3 |     | TOTAL |      |
|----------------------------------------------------|-------------------------------------|------------|---------------------|------------------------------|-------------------|-------------|-----------------|-----|-----------|-----|-----------|-----|-----------|-----|-------|------|
|                                                    |                                     |            |                     |                              |                   |             | \$\$            | FTE | \$\$      | FTE | \$\$      | FTE | \$\$      | FTE | \$\$  | FTE  |
| C-01                                               | Conserve Museum Objects             | N/A        | OBJC                | C15                          | CF2               | MIT         | 2.5             | .08 | 2.5       | .08 | 2.5       | .08 | 2.5       | .08 | 10.0  | .32  |
| C-02                                               | Manage Park Museum<br>Collection    | N/A        | OBJC                | C16                          | CF2               | MIT         | 3.4             | .2  | 3.4       | .2  | 3.4       | .2  | 3.4       | .2  | 13.6  | .80  |
| C-03                                               | Update and Maintain<br>ANCS Program | N/A        | OBJC                | C03                          | CF2               | ADM         | 1.4             | .08 | 1.4       | .08 | 1.4       | .08 | 1.4       | .08 | 5.6   | .32  |
| TOTAL FOR ALL FUNDED CULTURAL RESOURCES ACTIVITIES |                                     |            |                     |                              |                   |             | 7.3             | .36 | 7.3       | .36 | 7.3       | .36 | 7.3       | .36 | 29.2  | 1.44 |

PROGRAMMING SHEET 2  
UNFUNDED CULTURAL RESOURCES ACTIVITIES  
(\$ in thousands)

FY: 90  
Park: MOCA  
Region: WESTERN

| PK<br>PRI<br>NUM | PROJ<br>STATM<br>NUM | PROJECT OR ACTIVITY<br>TITLE                                                                                    | PKG<br>NUM | CULT<br>RES<br>TYPE | SERVICE-<br>WIDE<br>ISSUE(S) | FUNDING<br>SOURCE | ACT<br>TYPE | STARTING<br>YEAR |        | OUTYEAR 1 |          | OUTYEAR 2 |          | OUTYEAR 3 |          | TOTAL        |          |
|------------------|----------------------|-----------------------------------------------------------------------------------------------------------------|------------|---------------------|------------------------------|-------------------|-------------|------------------|--------|-----------|----------|-----------|----------|-----------|----------|--------------|----------|
|                  |                      |                                                                                                                 |            |                     |                              |                   |             | \$\$             | FTE    | \$\$      | FTE      | \$\$      | FTE      | \$\$      | FTE      | \$\$         | FTE      |
| 1                | I-03                 | Increase Natural<br>and Cultural<br>Resources Manage-<br>ment Staffing                                          | N/A        | COMB                | C24                          | CF1               | MIT         | 60.0             | 1.0    | 60.0      | 1.0      | 60.0      | 1.0      | 60.0      | 1.0      | 240.0        | 4.0      |
| 2                | I-04                 | Develop Biblio-<br>graphic Assessment<br>and Computerized<br>Bibliographic Infor-<br>mation Retrieval<br>System | N/A        | COMB                | C26                          | CF3               | RES         | 11.6             | 0.2    | 0         | 0        | 0         | 0        | 0         | 0        | 11.6         | 0.2      |
| 3                | C-04                 | Stabilize Pithouse<br>Floor                                                                                     | N/A        | STRC                | C12                          | CF7               | MIT         | 15.0             | 0.3    | 0         | 0        | 0         | 0        | 0         | 0        | 15.0         | 0.3      |
| 4                | I-05                 | Integrate Program<br>of Long-Term Moni-<br>toring for Cultural<br>and Natural Resources                         | N/A<br>N/A | COMB<br>COMB        | C19<br>C19                   | CF3<br>CF3        | RES<br>MON  | 35.0<br>0        | 0<br>0 | 0<br>8.5  | 0<br>0.2 | 0<br>8.5  | 0<br>0.2 | 0<br>8.5  | 0<br>0.2 | 35.0<br>25.5 | 0<br>0.6 |
| 5                | C-05                 | Improve Security<br>Systems                                                                                     | N/A        | OBJC                | C20                          | CF7               | PRO         | 15.0             | 0.1    | 0         | 0        | 0         | 0        | 0         | 0        | 15.0         | 0.1      |
| 6                | C-06                 | Rebuild MOCA Museum                                                                                             | N/A        | OBJC                | C16                          | CF10              | MIT         | 50.0             | 0      | 300.0     | 0        | 0         | 0        | 0         | 0        | 350.0        | 0        |
| 7                | C-07                 | Update Administr-<br>ative History                                                                              | N/A        | COMB                | C08                          | CF5               | RES         | 25.0             | 0      | 0         | 0        | 0         | 0        | 0         | 0        | 25.0         | 0        |
| 8                | C-08                 | Study of MOCA<br>Irrigation System                                                                              | N/A        | SITE                | C02                          | CF5               | RES         | 14.4             | 0.3    | 0         | 0        | 0         | 0        | 0         | 0        | 14.4         | 0.3      |
| 9                | C-09                 | Survey and Inven-<br>tory Collections<br>for MOCA Objects                                                       | N/A        | OBJC                | C10                          | CF5               | RES         | 36.0             | 1.0    | 18.0      | 0.5      | 0         | 0        | 0         | 0        | 54.0         | 1.5      |
| 10               | C-10                 | Update/Correct<br>CRBIB                                                                                         | N/A        | STRC                | C26                          | CF5               | RES         | 2.0              | 0.02   | 0         | 0        | 0         | 0        | 0         | 0        | 2.0          | 0.02     |

PROGRAMMING SHEET 2  
 UNFUNDED CULTURAL RESOURCES ACTIVITIES  
 (\$ in thousands)

FY: 90  
 Park: MOCA  
 Region: WESTERN

| PK<br>PRI<br>NUM                                     | PROJ<br>STATM<br>NUM | PROJECT OR ACTIVITY<br>TITLE                                                        | PKG<br>NUM | CULT<br>RES<br>TYPE | SERVICE-<br>WIDE<br>ISSUE(S) | FUNDING<br>SOURCE | ACT<br>TYPE | STARTING<br>YEAR |      | OUTYEAR 1 |     | OUTYEAR 2 |     | OUTYEAR 3 |     | TOTAL |       |
|------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------|------------|---------------------|------------------------------|-------------------|-------------|------------------|------|-----------|-----|-----------|-----|-----------|-----|-------|-------|
|                                                      |                      |                                                                                     |            |                     |                              |                   |             | \$\$             | FTE  | \$\$      | FTE | \$\$      | FTE | \$\$      | FTE | \$\$  | FTE   |
| 11                                                   | C-11                 | Completion of CSI                                                                   | N/A        | SITE                | C02                          | CF5               | RES         | 10.0             | 0.2  | 0         | 0   | 0         | 0   | 0         | 0   | 10.0  | 0.2   |
| 12                                                   | C-12                 | Excavate in<br>Montezuma Castle                                                     | N/A        | SITE                | C14                          | CF5               | RES         | 24.4             | 0.8  | 0         | 0   | 0         | 0   | 0         | 0   | 24.4  | 0.8   |
| 13                                                   | C-13                 | Archeological Over-<br>view and Assessment                                          | N/A        | SITE                | C02                          | CF3               | RES         | 6.0              | 0.1  | 0         | 0   | 0         | 0   | 0         | 0   | 6.0   | 0.1   |
| 14                                                   | C-14                 | Write Collection<br>Management Plan                                                 | N/A        | OBJC                | C09                          | CF3               | RES         | 2.0              | 0.03 | 0         | 0   | 0         | 0   | 0         | 0   | 2.0   | 0.03  |
| 15                                                   | C-15                 | Prepare Historic<br>Structure Preser-<br>vation Guide:<br>Historic Structures       | N/A        | STRC                | C06                          | CF5               | RES         | 30.0             | 0    | 0         | 0   | 0         | 0   | 0         | 0   | 30.0  | 0     |
| 16                                                   | C-16                 | Prepare Historic<br>Structure Preser-<br>vation Guide:<br>Prehistoric<br>Structures | N/A        | STRC                | C06                          | CF5               | RES         | 13.0             | 0    | 0         | 0   | 0         | 0   | 0         | 0   | 13.0  | 0     |
| 17                                                   | C-17                 | Maintain Stabilized<br>Prehistoric Ruins                                            | N/A        | STRC                | C12                          | CF7               | MIT         | 16.0             | 0.3  | 16.0      | 0.3 | 16.0      | 0.3 | 16.0      | 0.3 | 64.0  | 1.2   |
| 18                                                   | C-18                 | Establish Exhibit<br>Maintenance                                                    | N/A        | OBJC                | C16                          | CF8               | MIT         | 6.0              | 0.1  | 6.0       | 0.1 | 6.0       | 0.1 | 6.0       | 0.1 | 24.0  | 0.4   |
| 19                                                   | C-19                 | Maintain Historic<br>Structures                                                     | N/A        | STRC                | C13                          | CF7               | MIT         | 8.0              | 0.1  | 0         | 0   | 0         | 0   | 0         | 0   | 8.0   | 0.1   |
| 20                                                   | C-20                 | Obtain Historic<br>Photographs of<br>Montezuma Castle                               | N/A        | COMB                | C10                          | CF5               | RES         | 21.0             | 0.4  | 0         | 0   | 0         | 0   | 0         | 0   | 21.0  | 0.4   |
| TOTAL FOR ALL UNFUNDED CULTURAL RESOURCES ACTIVITIES |                      |                                                                                     |            |                     |                              |                   |             | 400.4            | 4.95 | 408.5     | 2.1 | 90.5      | 1.6 | 90.5      | 1.6 | 989.9 | 10.25 |

PROGRAMMING SHEET 1  
CURRENT YEAR FUNDED INTEGRATED ACTIVITIES  
(\$ in thousands)

FY: 90  
Park: MOCA  
Region: WESTERN

| PROJ<br>SYMT<br>NUM                                  | PROJECT OR ACTIVITY<br>TITLE                                   | PKG<br>NUM | CULT<br>RES<br>TYPE | SERVICE-<br>WIDE<br>ISSUE(S) | FUNDING<br>SOURCE | ACT<br>TYPE | CURRENT<br>YEAR |     | OUTYEAR 1 |     | OUTYEAR 2 |     | OUTYEAR 3 |     | TOTAL |      |
|------------------------------------------------------|----------------------------------------------------------------|------------|---------------------|------------------------------|-------------------|-------------|-----------------|-----|-----------|-----|-----------|-----|-----------|-----|-------|------|
|                                                      |                                                                |            |                     |                              |                   |             | \$\$            | FTE | \$\$      | FTE | \$\$      | FTE | \$\$      | FTE | \$\$  | FTE  |
| I-01                                                 | Natural and Cultural<br>Management and<br>Administration       | N/A        | COMB                | N24 C24                      | CF2<br>NF2        | ADM<br>ADM  | 7.7             | .17 | 7.7       | .17 | 7.7       | .17 | 7.7       | .17 | 30.8  | 0.68 |
|                                                      |                                                                |            |                     |                              |                   |             | 7.8             | .18 | 7.8       | .18 | 7.8       | .18 | 7.8       | .18 | 31.2  | 0.72 |
| I-02                                                 | Prepare a Management Plan<br>for Prehistoric Sinagua<br>Fields | N/A        | CULL                | N08                          | NF2<br>NF3        | ADM         | 2.0             | .05 | 0         | 0   | 0         | 0   | 0         | 0   | 2.0   | .05  |
|                                                      |                                                                |            |                     |                              |                   |             | 3.0             | .05 | 0         | 0   | 0         | 0   | 0         | 0   | 3.0   | .05  |
| TOTAL FOR ALL FUNDED INTEGRATED RESOURCES ACTIVITIES |                                                                |            |                     |                              |                   |             | 20.5            | .45 | 15.5      | .35 | 15.5      | .35 | 15.5      | .35 | 67.0  | 1.50 |

Natural Resources Project Statements: Funded Program

The following project statements are a description of the natural resources protection and information program currently funded and ongoing at Montezuma Castle National Monument.

## PROJECT STATEMENT

1. Project Number: MOCA-N-01

2. Project Title: Manage Pest Species

3. Service-wide Issue(s):

N04 - Degradation of Park Resources Due to Non-Native Animals

N05 - Degradation of Park Resources Due to Non-Native Plants

4. Problem Statement: Pests are generally a low level problem at Montezuma Castle, but they are a persistent and continuous problem that needs constant attention. Certain insects, clams, mammals, and plants, many non-native, cause problems that require periodic control measures. In the past five years, Integrated Pest Management (IPM) techniques have started to be used and will continue to be used as treatment for household, structural, wildland, and museum pests and for non-native species. Currently known pest problems are cited below.

Honeybees nest in cracks of the alcoves of Montezuma Castle and pose a hazard when they sting visitors and staff. When problems occur, the normal remedy has been to get local beekeepers to capture bees when they swarm. Earlier this year, one hive was flushed with soapy water to kill bees located close to the trail that had been stinging people. Periodic treatment will be necessary because the alcove provides nesting sites for bees. A more serious threat is the approaching Africanized honey bee. This is an aggressive non-native bee that has migrated northward from South and Central America since its accidental escape in the 1950's. A specific workshop was held January 1989 for dealing with management and safety concerns of Africanized bees. /Staff from Montezuma Castle/Tuzigoot attended the course.

Scorpions and conenose bugs occasionally are pests when they enter dwellings. Ants are occasionally in structures (in water damaged wood) or undermining sidewalks. Treatment for drywood and subterranean termites has been carried out in the past. A couple of years ago, girdling bark beetles occurred in the sycamores at Montezuma Well and killed some large branches. The sycamore lacebug and anthracnose fungus reportedly infested the sycamores at Montezuma Castle in the past. Monitoring will be conducted for museum pests as well.

The Asiatic clam was found to inhabit the outflow ditch from Montezuma Well. These clams are aggressive predators of native aquatic fauna. In 1985, a control project was completed whereby

a station was established that automatically dispenses a specified amount of chlorine, which is lethal to Asiatic clams. The chlorine application coupled with regular drying and cleaning of the ditch has been successful for eliminating the clams. Since the clams have been eliminated from the ditch, the mechanical treatment will continue indefinitely since the clams inhabit Wet Beaver Creek and can readily invade the ditch if treatment were discontinued.

Occasionally mammals become pests. Mice, ringtail cats, and rock squirrels burrow in the ruins and undermine structures. Raccoons knock over garbage cans in the picnic area. Alien turtles currently occur in the Well. Alien birds (i.e., pigeons) roost in nooks in the vicinity of the Castle. Bats roost in the attic of park housing. These are periodic problems inherent with the locality and available habitat.

Partial lists of non-native plants have been made for both monuments, i.e., tree of heaven, tamarisk, russian thistle, cheat grass, and horehound are a few. Some of these species are aggressive invaders. Work has been done to remove some weeds, but the method has not been timed correctly to eradicate them. Renewed action will be taken to control some plants when it is practicable. Native and non-native vegetation will be removed when found growing next to or within the walls of structures whether prehistoric, historic or modern.

The monument is getting a handle on its pest management problems. While this is not a major task, it is one that is continuous and requires application of integrated pest management techniques to solve problems and comply with NPS policies. Because of the natural and cultural environment, non-native species, and structures construction, managing pest will always be an ongoing duty. The problem is devoting the staff time to investigate proper IPM techniques and conduct them. This duty now fits into normal duties without consistent and effective methodologies, although progress has been made in this area. Much of the pest problems can be corrected with intensive action for most followed by low maintenance, i. e., removal of weeds. Other pests can be treated easily, i. e., screening vent opening to exclude bats from attics.

##### 5. Alternative Actions/Solutions And Their Probable Impacts:

a. Continue Current Level of Effort. The monument will continue to deal with its pest management problems using current staff. This will mean that this function will remain as a collateral duty and may not receive the full attention that it needs, but this pragmatic approach is far better than doing nothing at all.

b. Hire a Resources Management Specialist to Manage Pests. A staff position will be added to handle resources management duties, including pest management, as described in MOCA-I-03. This person will be responsible for identifying pest species and using IPM techniques to manage them. An IPM action plan will be written as necessary. An example of such an activity is the control of bee populations, as required for health and safety. Asiatic clams will be controlled with the existing routine treatment. Rodents will be trapped and removed from ruins. Non-native species will be assessed to determine the threat to resources and managed as practicable.

6. Description of the Recommended Project or Activity: Option b. is the recommended solution for this issue. Hire a natural and cultural resources management specialist to handle pest management along with other resources duties. This position is described in MOCA-I-03. Integrated pest management is the decision making process and action used by the National Park Service to deal with pest species. Therefore, we will follow NPS policy and guidelines to manage pest species. The IPM techniques will be used and an action plan written as necessary.

Until this preferred alternative is accomplished, the monument will continue to operate its pest management program with current staff (option a.) in order to keep the problem under reasonable control.

7. Compliance: Many IPM techniques are categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. Use of pesticides may warrant further consideration, so an environmental assessment is being prepared by the IPM Coordinator, Washington Office. NHPA compliance under Section 106 is necessary when cultural resources would be affected, such as treatment for termites that entails replacing wood in a historic structure.

8. Relationships: This project is related to seven other projects listed in this plan. These are as follows:

|           |                                       |                      |
|-----------|---------------------------------------|----------------------|
| MOCA-N-15 | Conduct Inventory and Assessment:     | Vegetation and Flora |
| MOCA-N-16 | Conduct Inventory and Assessment:     | Invertebrates        |
| MOCA-N-21 | Conduct inventory and Assessment:     | Non-native Species   |
| MOCA-C-01 | Conserve Museum Objects               |                      |
| MOCA-C-17 | Maintain Stabilized Prehistoric Ruins |                      |
| MOCA-C-18 | Establish Exhibit Maintenance         |                      |
| MOCA-C-19 | Maintain Historic Structures          |                      |

9. Funding Allocations: Funding is needed to support a full time position for natural and cultural resources management, with pest management duties being among the array of responsibilities for this position. This need is described in MOCA-I-03, requesting funds to support this position. Listed below is the current level of expenditures out of the park base for this activity.

|                      | <u>FY 90</u> | <u>FY 91</u> | <u>FY 92</u> | <u>FY 93</u> | <u>FY 94</u> |
|----------------------|--------------|--------------|--------------|--------------|--------------|
| Personal Services    | \$4,000      | \$4,000      | \$4,000      | \$4,000      | \$4,000      |
| Travel and Per Diem  | 0            | 0            | 0            | 0            | 0            |
| Supplies & Materials | <u>1,000</u> | <u>1,000</u> | <u>1,000</u> | <u>1,000</u> | <u>1,000</u> |
| Total                | \$5,000      | \$5,000      | \$5,000      | \$5,000      | \$5,000      |

10. Annual Project Status and Accomplishments: This report will be initiated once final determination is made by WASO on the proper Servicewide format.

## PROJECT STATEMENT

1. Project Number: MOCA-N-02
2. Project Title: Manage Vegetation: Rehabilitation, Landscaping, and Hazard Tree Removal
3. Service-wide Issue(s):  
N22 - Overuse/Impacts to Recreation and/or Landscaped Zones  
C17 - Control of Environmental Impacts

4. Problem Statement: The monument has heavy visitation, past site excavation, past grazing, social trailing, work access, and facilities development that result in occasional impacted areas needing restoration. While the total area is not large, staff is unable to keep up with organizing or completing the rehabilitation work due to the normal work load. They have been careful to rehabilitate these sites with various techniques such as planting native species, removing non-native plants, scarifying the soil to allow natural restoration, and closing work access to vehicles. In one occasion, non-native species were used as roadside plantings when the entrance road was improved.

Landscaping is also needed to maintain native plant compositions that align with the prehistoric and historic land uses. A major focus of this project would be to perpetuate the sycamore trees growing at Montezuma Castle. They are essential to the integrity of the monument and grow in areas that are heavily impacted, i.e., visitor center, picnic grounds, and Well. Thirty years ago pathologists and entomologists inspected the sycamore stands, and found the fungus known as anthracnose and the insect sycamore lacebug (*Corythucha confraterna*). For twenty-five years, the stand was treated with fertilization, litter removal, and spraying with malathion and zineb. This treatment was stopped in 1978. In the early 1980's, several large branches in the trees were killed by a bark beetle species which girdled the branches. To better understand the sycamore stand, a study of the autecology of the species was done in 1987. In 1988, a study began of the existing stand compared to an inventory done in 1931, which will show changes in four decades.

Landscaping with native plants is done to create a setting of native plants (some with cultural uses), to screen structures, and to provide shade. Landscape plans will be required in selected sites, especially those with heavy visitor use.

At the Well, the picnic area is very heavily used. Cottonwood, hackberry, and ash trees have been planted to replace removed old hazard trees, in an effort to perpetuate the aesthetic scene and to maintain a healthy stand of younger trees. Hazardous trees (cottonwoods) have been identified and removed primarily in the picnic area by the Well. A thorough survey will be done to document and remove hazardous trees.

Forthcoming construction of an additional sewage lagoon requires revegetation. Work has begun with Denver Service Center and Soil Conservation Service (SCS) to use onsite plant materials to restore vegetation cover. The National Park Service has as a goal to use onsite plant material to preserve genetic integrity of the vegetation component. Recently, SCS and NPS signed a Memorandum of Understanding to work together on revegetation projects. This is the first occasion for both agencies to use this agreement in Arizona.

Managing vegetation At Montezuma Castle and Montezuma Well is not a major task; however, it is one that takes dedication to completing throughout, well timed work. The problem is devoting staff time to work consistently on vegetation projects. Normal staff work load only permits partial attention to this duty.

5. Alternative Actions/Solutions And Their Probable Impacts:

a. Continue Current Level of Effort. The monument will continue to deal with vegetation management issues using current staff. This will mean that this function will remain as a collateral duty and may not receive the full attention that it needs, but this pragmatic approach is far better than doing nothing at all.

b. Hire a Resources Management Specialist to Manage Vegetation. With this alternative, a staff position will be added to handle resources management duties, including vegetation management, as described in MOCA-I-03. The monument will then develop a comprehensive approach to manage vegetation. This will be done in a proactive manner by identifying areas that need revegetation and landscaping, gathering botanical information about specific species, obtaining seed stock for demonstration gardens, and identifying and removing hazardous trees.

6. Description of the Recommended Project or Activity: Option

b. is the recommended solution for this issue. Hire a natural and cultural resources management specialist to manage vegetation. This position is described in MOCA-I-03. The person will develop a vegetation management plan that is comprehensive in providing information as well as guidelines for managing the plant systems. Prepare a landscape plan for selected sites such as the visitor center and picnic area. The follow up step will

be to implement the program which will entail site restoration, propagation of selected native species, garden preparation, landscaping for screening and perpetuation of natural setting. Identification of hazardous trees will be done by park staff and removal will be accomplished by staff or through a contract.

Until this preferred alternative is accomplished, the monument will continue to operate its pest management program with current staff (option a.) in order to keep the problem under reasonable control.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to six other projects listed in this plan. These are as follows:

|           |                                                                              |
|-----------|------------------------------------------------------------------------------|
| MOCA-N-09 | Conduct Riparian Ecosystem Research                                          |
| MOCA-N-14 | Determine Visitor Impacts and Use Limits                                     |
| MOCA-N-21 | Conduct inventory and Assessment: Non-native Species                         |
| MOCA-C-20 | Obtain Historic Photographs of Montezuma Castle                              |
| MOCA-I-01 | Natural and Cultural Resources Management and Administration                 |
| MOCA-I-05 | Integrate Program for Long-Term Monitoring of Cultural and Natural Resources |

9. Funding Allocations: Funding is needed to support a full time position for natural and cultural resources management, with vegetation management duties being among the array of responsibilities for this position. This need is described in MOCA-I-03, requesting funds to support this position. Listed below is the current level of expenditures out of the park base for this activity.

|                      | <u>FY 90</u> | <u>FY 91</u> | <u>FY 92</u> | <u>FY 93</u> | <u>FY 94</u> |
|----------------------|--------------|--------------|--------------|--------------|--------------|
| Personal Services    | \$5,500      | \$5,500      | \$5,500      | \$5,500      | \$5,500      |
| Travel and Per Diem  | 0            | 0            | 0            | 0            | 0            |
| Supplies & Materials | <u>500</u>   | <u>500</u>   | <u>500</u>   | <u>500</u>   | <u>500</u>   |
| Total                | \$6,000      | \$6,000      | \$6,000      | \$6,000      | \$6,000      |

10. Annual Project Status and Accomplishments: This report will be initiated once final determination is made by WASO on the proper Servicewide format.

## PROJECT STATEMENT

1. Project Number: MOCA-N-03

2. Project Title: Outflow Measurements for Montezuma Well

3. Service-wide Issue(s):

N12 - Alteration of Natural Flow Regimes

4. Problem Statement: Natural spring flows from Montezuma Well are monitored through an agreement with the U.S. Geological Survey. This agreement has been in force since the late 1970s. The U.S.G.S. maintains the flow records and reports the results to the NPS on an annual basis. The NPS takes daily readings according to a protocol developed by the U.S.G.S. and sends these data to the Survey for compilation and summary. This is the only long-term monitoring currently being performed on the water resources of the Well.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. This alternative would entail the cessation of the monitoring program. This is an unacceptable alternative.

b. Continue Current Monitoring Agreement with U.S.G.S. This alternative would keep the current agreement in force and continue the interagency cooperation that is so important to this effort.

6. Description of the Recommended Project or Activity: Option  
b. is the recommended solution for this issue.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of the Interior. NHPA compliance under section 106 is likewise not required for this project.

8. Relationships: This project is related to at least three other projects listed in this plan. These are as follows:

MOCA-N-04 Identify and Inventory Water-Related Resources  
MOCA-N-05 Evaluate Water Delivery Monitoring System  
MOCA-N-12 Protect the Hydrologic Characteristics of the  
Archeological and Historical Setting at Montezuma Well

9. Funding Allocations: Funding is needed to support a full time position for natural and cultural resources management, with water resources monitoring responsibilities being among the array of duties for this position. This need is described in MOCA-I-03, requesting funds to support this position. Listed below is the current level of expenditures out of the park base for this activity.

The \$2,000 in WASO Division of Water Resources funding for this project is transferred by Interagency Agreement to the U.S.G.S. The park base funds pays for the time of the ranger who makes the daily flow readings.

|                      | <u>FY 90</u> | <u>FY 91</u> | <u>FY 92</u> | <u>FY 93</u> | <u>FY 94</u> |
|----------------------|--------------|--------------|--------------|--------------|--------------|
| Personal Services    |              |              |              |              |              |
| Park Base Funds      | \$1,000      | \$1,000      | \$1,000      | \$1,000      | \$1,000      |
| WASO Water Resources | 2,000        | 2,000        | 2,000        | 2,000        | 2,000        |
| Travel and Per Diem  | 0            | 0            | 0            | 0            | 0            |
| Supplies & Materials | <u>0</u>     | <u>0</u>     | <u>0</u>     | <u>0</u>     | <u>0</u>     |
| Total                | \$3,000      | \$3,000      | \$3,000      | \$3,000      | \$3,000      |

10. Annual Project Status and Accomplishments: This report will be initiated once final determination is made by WASO on the proper Servicewide format.

Natural Resources Project Statements: Unfunded Program

The following project statements are a description of the natural resources protection and information program currently unfunded at Montezuma Castle National Monument.

## PROJECT STATEMENT

1. Project Number: MOCA-N-04
2. Project Title: Identify and Inventory Water-Related Resources
3. Service-wide Issue(s):  
N20 - Lack of Basic Data: Insufficient Understanding of Park Ecosystems and Threats to Them

4. Problem Statement: The water-related resources of the monument have not been fully identified. An inventory is needed to both identify the possibility of impact and to measure its magnitude, in the event impact does occur. This information will be required in water rights litigation or in any other similar arena in which the NPS seeks relief from such impact to protect the monument for the purposes for which it was created.

At present there exists an incomplete, and perhaps inadequate, understanding of the relationship of water to the resources of the monument. The first step in developing this understanding is identifying and inventorying the resources that are affected by or dependent upon water, both surface and subsurface.

The possibility of future impact to water-related resources exists because of residential and commercial development which is increasing in locations peripheral to the site. Water withdrawals from aquifers underlying the monument or alterations in surface water flow regimes are likely to affect water-related resources. Without an identification and inventory, assessments to arrest and reverse effects will be delayed resulting in additional or longer-lasting effects.

5. Alternative Actions/Solutions and their Probable Impacts:
  - a. No Action. This action would leave the monument without an adequate data base to protect its water rights or to understand the relationships between water resources of the monument and early man's activities at the site. Water-related resources might be lost under such stewardship.
  - b. Conduct a Thorough Inventory of All Water-related Resources in Montezuma Castle National Monument. Such a broad survey will give the superintendent an adequate data base from which to make informed management decisions and to protect water rights. Such

results will also be of use to all other resource related inventories conducted at the monument.

6. Description of the Recommended Project or Activity: Option b. is the recommended solution for this issue. This basic inventory of water-related resources will require a technical assessment of natural resources and scientific literature. This project will be best undertaken by an interdisciplinary team working as a unit. Field and office assessments will result in summary reports, maps and atlases. When completed, additional projects and/or studies will be required to evaluate the nature and magnitude of the relationship between water and water-related resources. Some of these studies have been identified as N-05, N-06, N-07, N-08, N-09, N-11, N-12, N-23, and N-24.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to at least nine other projects listed in this plan. These are as follows:

|           |                                                                                                       |
|-----------|-------------------------------------------------------------------------------------------------------|
| MOCA-N-05 | Evaluate Water Delivery Monitoring System                                                             |
| MOCA-N-06 | Analysis of Adjacent Land Use and Status                                                              |
| MOCA-N-07 | Inventory the Basic Natural Resources of Montezuma Well and Adjacent Riparian and Terrestrial Habitat |
| MOCA-N-08 | Assess Habitat Requirements of Aquatic Organisms at Montezuma Well                                    |
| MOCA-N-09 | Conduct Riparian Ecosystem Research                                                                   |
| MOCA-N-11 | Delineate and Evaluate Strategies for Wetlands Protection                                             |
| MOCA-N-12 | Protect the Hydrologic Characteristics of the Archeological and Historical Setting at Montezuma Well  |
| MOCA-N-23 | Evaluate Effects of Hydrologic Characteristics on Morphological Properties of Flowing Streams         |
| MOCA-N-24 | Evaluate Effects of Hydrologic Characteristics on Regeneration of Vegetation in Riparian Areas        |

9. Funding Requirements:

|                  | <u>Year 1</u> |
|------------------|---------------|
| Project Contract | \$20,000      |
| Total            | \$20,000      |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-N-05
2. Project Title: Evaluate Water Delivery Monitoring System
3. Servicewide Issue(s):  
N13 - Lack of Secure Water Rights
4. Problem Statement: Rights to the use of the water yield from Montezuma Well are held by the NPS and others. The rights held by the NPS are used for administrative purposes and historic irrigation. The existing system for monitoring the delivery of water to parties having rights thereto is inadequately installed. The result of this installation inadequacy is a poor data set and possibly inappropriate apportionment of available water. Further, this data inadequacy may place the NPS in an undesirable position if it were to be involved in water rights-related litigation.  
  
Population increases have occurred in this area as in many others in the southwest. Consequently, residential and commercial development have been steadily increasing in locations peripheral to the site. The nature and effect of increased water use and consumption associated with this development are presently unknown. However, it may be that water is being removed from the natural avenues of surface and subsurface water delivery that supply the 'Well'. If a significant diminution in water delivery occurs, the water rights of the United States may be impaired.
5. Alternative Actions/Solutions and their Probable Impacts:
  - a. No Action. This option would require that the monument continue to operate its water rights partitioning program under a antiquated delivery system that has not been monitored or evaluated for accuracy for many years.
  - b. Evaluate Water Monitoring System. Conduct an evaluation of the water monitoring system to ensure that the partitioned water rights are being fairly and correctly metered. The effects of population growth in the Verde Valley on spring flow also needs to be evaluated.

6. Description of the Recommended Project or Activity: Option b. is the recommended solution for this issue. Improving the water delivery monitoring system requires a careful analysis of all existing data, construction of a new monitoring system, and the correlation of old with new discharge data. This project will require some facility construction and the development of rating curves.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to at least four other projects listed in this plan. These are as follows:

|           |                                                                                                      |
|-----------|------------------------------------------------------------------------------------------------------|
| MOCA-N-12 | Protect the Hydrologic Characteristics of the Archeological and Historical Setting at Montezuma Well |
| MOCA-N-22 | Examine Old Fields                                                                                   |
| MOCA-C-08 | Study Montezuma Castle Irrigation System                                                             |
| MOCA-C-16 | Prepare Historic Structures Preservation Guide: Prehistoric Structures                               |

9. Funding Requirements:

|                   | <u>Year 1</u> |
|-------------------|---------------|
| Research Contract | \$10,000      |
| Total             | \$10,000      |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-N-06
2. Project Title: Analysis of Adjacent Land Use and Status.
3. Service-wide Issue(s):

N16 - Visual and Biological Impacts of Urbanization and Other  
Near-Park Development on Park Resources

4. Problem Statement: The Verde Valley of Arizona has an enormous array of recreational opportunities. According to Marshall A. Worden in the publication *Papers in Community and Rural Development, 1981*, "the Verde valley may well contain the greatest density of different types of vacation or recreational experiences of any similarly sized area in Arizona". Tourism at the Castle alone last year exceeded 657,000 people. Concomitant local population growth has also increased dramatically as economic employment opportunities increased. Consequently, the diversification of land use practices are changing at an alarming rate. Accelerated growth increases the frequency and complexity of resource issues while simultaneously reducing the amount of time that management has to react to resource concerns. In addition, having two discontinuous management districts of less than 870 acres magnifies the degree of danger associated with each potential threat. The ingredients and characteristics that have created such an unusually rich and diverse environment for resource concerns are many.

A few examples of nearby land uses are: urbanization, aggregate mining, surface water diversions, agriculture, grazing, ranching, and recreational opportunities such as camping, golf, fishing, horseback riding, and swimming. These activities are impacting cultural, water and other natural resources at Montezuma Castle, Montezuma Well and along Beaver Creek and its tributaries.

Beaver creek, a significant part of the historic scene and a major tributary of the Verde River, meanders southward approximately 10 miles from the well before joining the Verde River from the North. Six river miles upstream from its mouth, Beaver Creek passes Montezuma Castle. The castle is the best preserved example of cliff dwellings remaining from an extinct Sinaguan culture.

Dry Beaver Creek flows adjacent to Montezuma Well and is located about six miles upstream of the confluence of Wet Beaver Creek and Beaver Creek. Continued expansion of nearby population centers prompts concern for protection of this valuable resource.

Without the basic baseline information necessary for assessing future changes in the area's hydrological regime and proximate land utilization factors the historic and cultural scenes cannot be maintained adequately. An analysis of adjacent land use is a prerequisite step in determining the degree and magnitude of factors that may influence management's ability to resolve or anticipate potential resource utilization conflicts. Preliminary indications suggest that recent habitat conversions have already resulted in a loss of biological diversity and are impacting the adjacent riparian corridor.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. Analysis of Adjacent Land Use and Status. Contract a Land Use research study that compares past and present land use patterns, evaluates present utilization conflicts and resource concerns that are currently impacting the monument. This project should also attempt to develop a system that quantifies the potential risks associated with each resource threat or concern.

b. No Action. With this action the monument will have to continue to operate without being able to estimate or predict significant external threats resulting from changing land use patterns. This places management in a difficult position of trying preserve and protect a cultural landmark without knowledge of existing external threats.

6. Description of the Recommended Project or Activity: Option

a. is the recommended solution for this issue. Let a research contract to document and map existing land uses, evaluate historical patterns of land use, and identify external threats resulting from adjacent land use practices. This would entail a three part research study as follows:

1) Identify issues, concerns, and opportunities by a) developing land utilization maps that illustrate present uses, historical changes, and legal land status; and b) developing a research program to quantify and evaluate potential threats resulting from land use conflicts.

2) Analyze the management situation and assess the risk level stemming from each external threat attributed to a land use pattern or concern.

3) Develop a cost effective monitoring protocol system for monument staff to reevaluate external threats on a periodic basis. Recommend management actions to mitigate, or if possible eliminate, external threats stemming from external land uses. Make recommendations on how to develop community awareness programs through interpretive and outreach programs.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to at least twelve projects listed in this plan. These are as follows:

|           |                                                                                                       |
|-----------|-------------------------------------------------------------------------------------------------------|
| MOCA-N-07 | Inventory the Basic Natural Resources of Montezuma Well and Adjacent Riparian and Terrestrial Habitat |
| MOCA-N-09 | Conduct Riparian Ecosystem Research                                                                   |
| MOCA-N-15 | Conduct inventory and Assessment: Vegetation and Flora                                                |
| MOCA-N-16 | Conduct Inventory and Assessment: Invertebrates                                                       |
| MOCA-N-17 | Conduct inventory and Assessment: Amphibians and Reptiles                                             |
| MOCA-N-18 | Conduct inventory and Assessment: Birds                                                               |
| MOCA-N-19 | Conduct inventory and Assessment: Soils                                                               |
| MOCA-N-20 | Conduct inventory and Assessment: Mammals                                                             |
| MOCA-N-24 | Evaluate Effects of Hydrologic Characteristics on Regeneration of Vegetation in Riparian Areas        |
| MOCA-N-26 | Conduct inventory and Assessment: Fishes                                                              |
| MOCA-I-04 | Develop Bibliographic Assessment and Computerized Bibliographic Information Retrieval System          |
| MOCA-I-05 | Integrate Program for Long-Term Monitoring of Cultural and Natural Resources                          |

9. Funding Requirements:

Year 1

|                   |          |
|-------------------|----------|
| Research Contract | \$30,000 |
| Total             | \$30,000 |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-N-07

2. Project Title: Inventory the Basic Natural Resources of Montezuma Well and Adjacent Riparian and Terrestrial Habitat

3. Service-wide Issue(s):

N20 - Lack of Basic Data: Insufficient Understanding of Park Ecosystems and Threats to Them

4. Problem Statement: Montezuma Well is a unique, spring fed lake nearly circular in shape, with a diameter of about 360 ft. (112 meters). It was formed in a limestone sink approximately 10,000 years ago. No other ecological equivalent to Montezuma Well has yet been found worldwide (George Ruffner, Personal Communication). A sizeable human community has developed just south of the monument in the past 20 years and it is still growing. A growing population necessarily increases demand for and consumption of groundwater, which consumption may have a negative impact on the Well. A survey of all resources associated with the Well is badly needed. Tens, if not hundreds, of taxa in Montezuma Well are found nowhere else on earth. The breadth of species diversity and the complexity of interactions among organisms in this one-of-a-kind ecosystem are only now beginning to be recognized. Ecological knowledge of the Well is very limited. Increasing visitation, human population growth, and changes in land use patterns present a real threat to the long-term protection of this unique resource.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. This option will result in continued management of the Well without knowing what unique species and communities exist there. It is likely that any degradation of the Well may occur without NPS knowledge or management action to prevent it. Species, or entire ecological communities could be lost without anyone knowing it.

b. Continue Present Program. The National Park Service has funded very little biological research in the Well. A vegetation study around the rim of the Well was funded in 1987 and one within the sink was funded in 1988. Outside researchers, however, are encouraged to use their own funding sources to conduct studies in the Well, provided their research proposal

demonstrates that they will do no harm to the resources. This option may result in many of the same problems as the no action alternative due to the slow pace of research.

c. Fund and Conduct a Thorough Resources Basic Inventory of the Well and Adjacent Riparian and Terrestrial Areas. This option will provide the superintendent with in-depth information on occurrence and status of rare species in the well and some aspects of their life history. This study will also indicate what species of native and alien plants and animals are present in the well and its adjacent areas. The study will also provide an understanding of the interrelationships among the aquatic, riparian, and terrestrial components of the ecosystem. This information about the well and its biota will allow the manager to make appropriate decisions in protecting the resources associated with the well on both a short term and a long term basis.

6. Description of the Recommended Project or Activity: Option c. is the recommended solution for this issue. Fund and conduct a thorough resources basic inventory of the well and adjacent riparian and terrestrial areas. This study will be conducted through a combination of research contracts and NPS scientists. It will consist of the following components:

- 1) A thorough bibliographic search, review, and summary of information from literature. Over 50 scientific reports and papers have been published on a variety of scientific subjects regarding the Well. They describe its geology, provide some data on water quality and quantity, water turnover rate, sediments, etc. This search should include historic photos and aerial photographs of the area.

- 2) A complete taxonomic listing of plants (including cryptogams) and animals that occur in the study site, including annotations on relative abundance, distribution, life history, phenology, etc., based on observations during this study as well as information from the literature. The species inventory within the Well and its associated outflow irrigation ditch will include phytoplankton and zooplankton.

- 3) An evaluation of interrelationships among the aquatic, riparian, and terrestrial species and ecological communities. The study will evaluate, for example, the ecological role of water fowl and other water birds, riparian songbirds (passerines) along the well and outflow ditch.

- 4) A written evaluation of key species and critical food chains, also discussing observations of, or potential for, any native species being threatened by alien species or human activities. A discussion of known or potential threats to

ecosystem components, along with considerations of manipulative management, habitat, or species protection or restoration, etc. will also be included here.

5) The preparation of interpretive and educational programs for use in presenting a more complete and accurate story of this unique resource.

6) Products from this study will be scientific report(s), species listings and annotations, taxonomically identified specimens to be curated in appropriate museums and herbaria, reference specimens of selected species for use in the monument by scientists, interpreters, etc. Specific suggestions will be made in writing and in an oral presentation to the monument staff on the implications of study findings to both management and interpretation. The researchers will also recommend any further studies that may be necessary to manage the resources of the well, the outflow ditch, and adjacent riparian and terrestrial habitats.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to at least eight other projects listed in this plan. These are as follows:

|           |                                                           |
|-----------|-----------------------------------------------------------|
| MOCA-N-04 | Identify and Inventory Water-Related Resources            |
| MOCA-N-09 | Conduct Riparian Ecosystem Research                       |
| MOCA-N-11 | Delineate and Evaluate Strategies for Wetland Protection  |
| MOCA-N-16 | Conduct Inventory and Assessment: Invertebrates           |
| MOCA-N-17 | Conduct Inventory and Assessment: Amphibians and Reptiles |
| MOCA-N-18 | Conduct Inventory and Assessment: Birds                   |
| MOCA-N-20 | Conduct Inventory and Assessment: Mammals                 |
| MOCA-N-21 | Conduct inventory and Assessment: Non-native Species      |

9. Funding Requirements:

|                       | <u>Year 1</u> | <u>Year 2</u> |
|-----------------------|---------------|---------------|
| Personal Services     | \$18,000      | \$10,000      |
| Travel and Per Diem   | 3,000         | 1,500         |
| Limnological Supplies | 1,000         | 0             |
| Publication Costs     | 0             | 800           |
| Total                 | \$22,000      | \$12,300      |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-N-08

2. Project Title: Assess Habitat Requirements of Aquatic Organisms at Montezuma Well

3. Service-wide Issue(s):

N20 - Lack of Basic Data: Insufficient Understanding of Park Ecosystems and Threats to Them

4. Problem Statement: The aquatic organisms indigenous to Montezuma Well are water-related resource attributes of importance to this site. Their importance to the archaeological/historical story of this NPS unit is unknown but the organisms have importance in their own right due to their uniqueness. Their habitat requirements have been met historically through the particular combination of water quality and quantity in the Well. However, it is not known whether these characteristics have been stable over time or have been changing progressively. If changes have occurred, the present state-of-knowledge does not allow for an assessment of the nature, magnitude, or cause for such change or of the possible consequences.

It is not unreasonable to anticipate that changes in water quantity and quality will be manifest at the Well due to increasing residential and commercial development in locations peripheral to the site. If a significant diminution in water delivery occurs, or if water quality substantially changes, then this water-related resource attribute may be adversely affected. Once affected, there is presently no means whereby the consequences may be assessed.

5. Alternative Actions/Solutions and their Probable Impacts:

a. No Action. This option would mandate the monument continue to manage the Well without any empirical knowledge of the resources of the Well. The Well is a unique natural wonder that contains many rare and endemic species. It is only through the acquisition of scientific data that this habitat can be properly protected and interpreted.

b. Study Aquatic Organisms. Conduct a scientific study of aquatic organisms and their habitat requirements at Montezuma Well. The few studies that have been conducted thus far have

found many unique endemic life forms in the Well. This resource is obviously unusual and has led to the development of life forms found nowhere else on earth. It is imperative that the Well be systematically studied before unforeseen events degrade the Well and destroy unknown organisms.

6. Description of the Recommended Project or Activity: Option b. is the recommended solution for this issue. The assessment of aquatic organisms and their habitat requirements requires monitoring water replacement rate and standing water surface elevation, characterizing existing water quality, characterizing organism habitat requirements, modelling and/or estimating potential changes in water quantity and quality and identifying activities or geographical areas that could impact water quantity or quality. This information would be necessary to ensure protection of this water-related resource attribute from off-site water development and use.

Accomplishing the above requires an interdisciplinary approach to characterize the existing hydrologic and water quality regimes as well as the biotic needs of the indigenous organisms. The analysis of data collected will require the use of both computer models and expert opinion to assess current conditions and to predict probable conditions.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to at least two other projects listed in this plan. These are as follows:

MOCA-N-04 Identify and Inventory Water-Related Resources  
MOCA-N-07 Inventory the Basic Natural Resources of Montezuma  
Well and Adjacent Riparian and Terrestrial Habitat

9. Funding Requirements:

|                   | <u>Year 1</u> | <u>Year 2</u> | <u>Year 3</u> |
|-------------------|---------------|---------------|---------------|
| Research Contract | \$25,000      | \$22,000      | \$18,000      |
| Total             | \$25,000      | \$22,000      | \$18,000      |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-N-09
2. Project Title: Conduct Riparian Ecosystem Research
3. Servicewide Issue(s):  
N12 - Alteration of Natural Flow Regimes/Groundwater Levels
4. Problem Statement: Two levels of concern are (a) completion of an inventory and assessment of natural riparian resources and (b) an assessment of past, current, and proposed management actions and visitor activities on natural riparian resources. Montezuma Castle National Monument was set aside because of its ". . . ethnological value and scientific interest. . ." The historic and prehistoric structures around which the major interest for visitors is focused are located on cliffs immediately adjacent to the floodplain and riparian lands along Beaver Creek. The surface and groundwater sources that currently support riparian ecosystems also served as water supplies for domestic and agricultural use for prehistoric humans. Additionally, riparian vegetation produces the cooler, more mesic landscape that is so attractive to visitors in this arid region. Additional information is also needed for increasing the interpretive values general understanding of these riparian lands.

Structures currently located in the riparian zone include surfaced walks, drinking fountains, interpretive displays, a picnic area, and a several-hundred-foot-long gabion structure of rock and reinforcing metal mesh constructed by the CCC in the 1930's to deflect flood waters from areas of high visitor-use. Visual examination of the riparian zone indicates that reestablishment rates of riparian trees (Arizona sycamore, net-leaved hackberry, chinaberry, velvet ash, etc.) seem low. Recruitment rates of young trees may be insufficient to replace the desirable riparian groves which are an important part of both the natural and cultural landscape. Examination of similar (control) areas nearby is needed to determine the relative condition of our groves and, if they are in poor condition, whether current and/or past management practices and/or visitor activities may be implicated and what changes would be needed to modify current impacts.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. Conduct Riparian Ecosystem Research. This option, discussed in detail in the following section of this project statement, would provide management with alternatives, including proposed actions and probable results, based on solid research findings. In addition to vegetation and faunistic implications of proposed management actions, attempts will be made to integrate information on soils, hydrology and flood regimes, and supporting information from current and past research programs in the area. The Principal Investigator will also design long-term monitoring protocols for these components of the ecosystem.

b. No Action. This option would cause the continued management of the monument with insufficient knowledge of existing ecosystem components and processes with possible losses to both the natural and cultural landscapes and reduction in visitor satisfaction.

6. Description of the Recommended Project or Activity: Option a. is the recommended solution for this issue. An inventory of the riparian zone adjacent to both Montezuma Castle and Montezuma Well will examine biotic and abiotic ecosystem components with emphasis on vertebrates and flowering plants. An assessment of major components will be conducted for riparian trees, birds, and other groups that are determined to be of particular significance during the study. In addition, close monitoring of other studies is needed to interrelate and synthesis information of value to this project. Emphasis will be placed on ecological components, e.g. indicator species, that are of particular concern to interpreters and resource managers. Major project components, or subprojects, identified at the time of writing this project statement are listed below. However, additional components may be identified from information gathered during the course of the projects.

1) Conduct an inventory and assessment of tree and shrub populations, their demographic structure, distribution, and health.

2) Examine hydrologic and soil parameters associated with riparian groves.

3) Conduct an assessment of riparian plants and their interrelationships with hydrology, soil, and animals species.

4) Use information from the avian inventory and assessment to examine avian populations in relation to vegetational parameters and interpretive value.

5) Use information from the mammalian inventory and assessment to examine mammalian populations in relation to vegetational parameters with special emphasis on pest species, e.g. rock squirrels and ring-tailed cats.

6) Use information from the herpetological inventory and assessment to examine amphibians and reptiles with emphasis on their interrelationships with vegetational communities and interpretive values.

7) Use information from the invertebrate inventory and assessment to examine interrelationships with plants and other animals and interpretive value of such information.

8) A long-term monitoring program will be designed for these components of the ecosystem. The monument staff will be trained in the implementation of these protocols.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to at least five other projects listed in this plan. These are as follows:

|           |                                                                                                       |
|-----------|-------------------------------------------------------------------------------------------------------|
| MOCA-N-04 | Identify and Inventory Water-Related Resources                                                        |
| MOCA-N-06 | Analysis of Adjacent Land Use and Status                                                              |
| MOCA-N-07 | Inventory the Basic Natural Resources of Montezuma Well and Adjacent Riparian and Terrestrial Habitat |
| MOCA-N-08 | Identify and Inventory Aquatic Organisms and Their Habitat Requirements at Montezuma Well             |
| MOCA-I-05 | Integrate Program for Long-Term Monitoring of Cultural and Natural Resources                          |

9. Funding Requirements:

|                        | <u>Year 1</u> | <u>Year 2</u> | <u>Year 3</u> | <u>Year 4</u> |
|------------------------|---------------|---------------|---------------|---------------|
| Personal Services      | \$ 8,000      | \$ 8,000      | \$12,500      | \$12,500      |
| Travel and Per Diem    | 1,500         | 1,500         | 2,000         | 500           |
| Equipment and Supplies | <u>500</u>    | <u>500</u>    | <u>500</u>    | <u>2,000</u>  |
| Total                  | \$10,000      | \$10,000      | \$15,000      | \$15,000      |

First Year: Begin research with riparian vegetation, especially woody plant communities of the castle and well sections, and make collections of riparian non-woody species.

Second Year: Begin collection of information documenting interrelationships between plant species and communities, and plants and animals in the riparian ecosystem.

Third Year: Start integration of information from other studies for riparian biota, particularly information on vertebrates, endemic invertebrates, and riparian processes.

Fourth Year: Complete integration of information from all files, studies, etc. and prepare reports for resources management and interpretive programs. Provide management alternatives and projected results of management actions. Long-term monitoring protocols will be designed and the monument staff trained in their implementation.

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-N-10

2. Project Title: Conduct Visitor Use Survey

3. Servicewide Issue(s):

N22 - Overuse/Impacts to Recreation and/or Landscaped Zones

4. Problem Statement: Other than the Public Area Recreation Visitor Survey (PARVS) jointly conducted in 1985 by the National Park Service, U.S. Forest Service, Army Corps of Engineers, Tennessee Valley Authority, and numerous state park systems, no formal visitor use data collection is known to have occurred at Montezuma Castle National Monument. A review of the *Summary Results of the Public Area Recreation Visitor Survey Open-ended Questions* memo distributed to participating areas by the WASO Recreation Resources Assistance Division in December, 1986 revealed only cursory information regarding visitor impressions of the Montezuma Castle recreational experience. Results from the balance of the PARVS survey are still being analyzed and therefore the overall quality and utility of this information are currently unknown. Available baseline visitor data is therefore at a premium. Without further knowledge of the PARVS data, the adequacy of it to perform its primary function of assisting monument personnel with visitor management is seriously in question. Visitor use information provides managers with highly valuable insight into a host of visitor characteristics including demographics, perceptions, expectations, satisfactions, and behavior. Knowledge of these aspects enhances the managers' abilities to: (1) provide the user public with high quality recreational experiences, and (2) preserve and protect the values which attract visitors and for which the monuments were established. Visitor use information is helpful under any level of visitation, but its value increases greatly as visitation grows. Visitation at the monument (including Montezuma Well) has roughly doubled since 1970, with the 1987 total exceeding 830,000. Visitation at the Castle (>657,000 in 1987), the highest visitor use area, accounts for over three-fourths of the total and has risen more than 58 percent during the past five years. The trend for sharply increased visitation is expected to continue, thereby steadily increasing the already great need for essential baseline information. Although never satisfied, the need to accumulate basic data through research on "visitor use patterns pertinent to the monument for its resource management and interpretive programs" is clearly stated as a resource management objective in the 1975 Final Master Plan.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. Conduct a Visitor Use Survey. A mail-in questionnaire design would be least expensive in terms of taxing monument personnel. This type of survey is widely used in public recreation areas nationally because of its flexibility, comprehensiveness, and relative ease of administration and interpretation of results. Such surveys can be tailored to provide managers with precisely what they need to know concerning their visitor population. Survey information can identify visitor related problems and form the basis for appropriate management actions. The completion of a visitor use survey would satisfy: 1) the need to accumulate basic visitor data through research on "visitor use patterns pertinent to the monument for its resource management and interpretive programs" specified in the Resource Management Objectives section of the 1975 *Final Master Plan*; and 2) the statement "visitor use statistics will be gathered, recorded, and analyzed on a continuing basis" within the Cultural and Natural Resources Research and Management Actions section of the Monument's 1976 *Cultural and Natural Resources Management Plan and Assessment*.

b. No Action. The historical lack of baseline visitor information continues, further hindering personnel in their efforts to sensitively and effectively manage visitors while providing them with quality visits. Lack of survey implementation also fails to satisfy the visitor use information directive stated in the 1975 *Final Master Plan*.

6. Description of the Recommended Project or Activity: Option a. is the recommended solution for this issue. Conduct a visitor use survey using a mail-back questionnaire tailored to the perceived visitor use informational needs of monument personnel. This questionnaire should be developed by CPSU/UA staff or a private contractor. The questionnaire would be distributed on-site by monument personnel according to specified random distribution guidelines. All questionnaire data would be computerized and results generated using appropriate software.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to at least one other project listed in this plan. This is as follows:

MOCA-N-14 Determine Visitor Impacts and Use Limits

9. Funding Requirements:

|                             | <u>Year 1</u> |
|-----------------------------|---------------|
| Survey Questionnaire Design | \$ 3,500      |
| Questionnaire Execution     | 3,000         |
| Data Analysis               | 3,500         |
| Travel and Per Diem         | 1,000         |
| Publication Costs           | <u>800</u>    |
| Total                       | \$11,800      |

(Costs are for a one year, in-house (CPSU) study involving one or more NPS Research Scientists and a half-time, GS-5 graduate student; assumes computer requirements already satisfied and no use of paid, outside consultants)

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-N-11
2. Project Title: Delineate and Evaluate Strategies for Wetlands Protection.
3. Servicewide Issue(s):  
N12 - Alteration of Natural Flow Regimes/Groundwater Levels

4. Problem Statement: Corps of Engineers and EPA regulations (33 CFR Section 238.3 and 40 CFR Section 230.3 respectively) define wetlands as "...areas that are inundated or saturated with surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." This definition has been in effect since 1977. Both Montezuma Castle management districts have wetlands that have not been evaluated or clearly delineated. External factors are impacting the quality and quantity of these water related resources, which directly affects management's ability to preserve and protect the resources.

The best known of these water resources is Montezuma Well, which is an unstratified, thermal limnocrene, with an area of 0.76 ha and a maximum depth of 17 meters with average subterranean flows of 1.5 million gallons a day. It is internationally recognized for its scientific and cultural uniqueness.

Beaver Creek, Wet Beaver Creek, and adjacent wetlands are integrated components of the cultural setting and are the primary resources responsible for maintaining the existing biological diversity. The *Final Master Plan* (1975) calls for staff to preserve the integrity of the cultural and natural settings. This cannot be accomplished without evaluating the permanence of the existing wetlands using a multidisciplinary approach. A multidisciplinary strategy must be developed to generate management options to reduce the external pressures exerted upon the Monument's resources. Furthermore, an examination of regulatory issues is mandatory to provide management with the appropriate context for decision making.

In addition to developing a multidisciplinary approach to collect the necessary field data and information, many technical judgments and inferences will have to be made to delineate and evaluate the wetlands in the appropriate jurisdictional setting. Operational methodologies will have to be developed for

monitoring the health and stability of the water resources. Administrative policies, guidelines, and constraints will have to be reviewed extensively in the delineation process to secure and protect these wetlands.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. With this alternative the monument will not be able to assess the degree of external threats and pressures exerted upon the monuments cultural, natural and water resources. Management will have to make decisions in the absence of knowledge and without quantification of hydrological factors that are used in evaluating, delineating, and protecting water resources and wetlands.

b. Delineate and Evaluate Strategies for Wetland Protection. Based upon the results of MOCA-N-10 and N-15, a multi-disciplinary research team will quantify the current status of existing and potential threats to Montezuma Castle's wetland resources. Subterranean water flow, stability, and other hydrological factors will be examined along with stream dynamics and erosion potentials. Administrative guidance for these actions may be found in Executive Order 11990, the 1975 *Final Master Plan*, the current *Resource Management Plan*, and numerous DOI regulatory requirements and or guidelines. In addition to quantifying water resource threats, the research team will develop strategies to protect these resources. Management alternatives and options will be identified to mitigate each threat. All recommendations would be subsequently prioritized and evaluated on evidence.

6. Description of the Recommended Project or Activity: Option b. is the recommended solution for this issue. A multi-disciplinary team would be contracted or assembled to address the concerns outlined in the above problem statement. NPS specialists, along with other experts, would participate actively to develop the necessary management strategies involved in protecting these resources. Some technological analysis may have to be contracted to obtain the necessary field data and hydrological information.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to at least eight other projects listed in this plan. These are as follows:

|           |                                                                                                       |
|-----------|-------------------------------------------------------------------------------------------------------|
| MOCA-N-04 | Identify and Inventory Water-Related Resources                                                        |
| MOCA-N-07 | Inventory the Basic Natural Resources of Montezuma Well and Adjacent Riparian and Terrestrial Habitat |
| MOCA-N-08 | Identify and Inventory Aquatic Organisms and Their Habitat Requirements at Montezuma Well             |
| MOCA-N-09 | Conduct Riparian Ecosystem Research                                                                   |
| MOCA-N-12 | Protect the Hydrologic Characteristics of the Archeological and Historical Setting at Montezuma Well  |
| MOCA-N-25 | Develop GIS System                                                                                    |
| MOCA-I-04 | Develop Bibliographic Assessment and Computerized Bibliographic Information Retrieval System          |
| MOCA-I-05 | Integrate Program for Long-Term Monitoring of Cultural and Natural Resources                          |

9. Funding Requirements:

Year 1

|                   |          |
|-------------------|----------|
| Research Contract | \$15,000 |
| Total             | \$15,000 |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-N-12
2. Project Title: Protect the Hydrologic Characteristics of the Archaeological and Historical Setting at Montezuma Well

3. Service-wide Issue(s):

N12 - Alteration of Natural Flow Regimes

4. Problem Statement: The water surface level at Montezuma Well is, itself, a water-related resource of this site. The height to which water rises in the Well is important to the archaeological and historical story of this NPS unit. Specifically, the visitor is presented with a unique, for this desert location, natural structure which had an obviously important relationship to the habitation of this area by ancient people. Subject to natural variation, the water surface elevation in the Well should be maintained as close to its prehistoric level as possible to convey to the visitor an appreciation of 1) the locations of water and dwellings, relative to one another, and 2) the delivery of water to the ancient irrigation systems.

Population increases have occurred in this area as in many others in the southwest. Consequently, residential and commercial development has been steadily increasing in locations peripheral to the Well Unit. The nature and effect of increased water use and consumption associated with this development is presently unknown. However, it may be that water is being removed from the natural avenues of surface and subsurface water delivery that supply the Well. If a significant diminution in water delivery occurs, this water-related resource attribute may be adversely affected and, as a consequence, the purposes for which this unit was established may be jeopardized.

While outflow from the Well has been monitored in the past, no information has been collected which assesses either water surface elevation or inflow to the system. Furthermore, questions have been raised as to the efficacy of current outflow measurement efforts due to shortcomings in the measurement installation. More importantly, there currently exists no means for alerting management to imminent adverse, and possibly irreversible, effects to this resource attribute from external water use.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. This option will dictate that the Service continue to manage Montezuma Well without a scientifically designed and tested monitoring system. Management without factual data is a dangerous proposition.

b. Study Hydrologic Characteristics. Conduct a thorough hydrologic characterization of the groundwater system supporting and maintaining Montezuma Well. This information will make it possible to evaluate potential effects of off-site land development on water flows in the Well through the use of mathematical models of existing and potential water withdrawals.

6. Description of the Recommended Project or Activity: Option b. is the recommended solution for this issue. The protection of the hydrologic characteristics of the archaeologic and historic setting at the Well requires monitoring the standing water surface elevation and identifying geographical areas where existing and future water withdrawals may be of concern. To explain, the areas around the Well which recharge the aquifer supplying the springs within its perimeter, should be identified so that special attention may be directed toward monitoring off-site water development. If water development is found to affect this water-related resource attribute, then appropriate action may be taken, through state administration of water rights or through other means, to prevent both irreversible damage to the site and financial hardship to private development interests outside the unit.

However, to support allegations of impact from outside water development and use, the characteristics of the aquifer must be scientifically identified and potential impacts must be evaluated. This will require a thorough hydrologic characterization of the water system supporting the Well. This characterization will include assessments of piezometric water surface in the recharge area, aquifer characteristics and, possibly, ground water quality or age determination followed by mathematical modelling of existing and potential water withdrawal. Ancillary to these efforts would be an assessment of historical water levels using both computer simulation and historical research.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to at least four other projects listed in this plan. These are as follows:

MOCA-N-07 Inventory the Basic Natural Resources of Montezuma Well and Adjacent Riparian and Terrestrial Habitat  
MOCA-N-08 Identify and Inventory Aquatic Organisms and Their Habitat Requirements at Montezuma Well  
MOCA-N-11 Delineate and Evaluate Strategies for Wetland Protection  
MOCA-I-05 Integrate Program for Long-Term Monitoring of Cultural and Natural Resources

9. Funding Requirements:

|                   | <u>Year 1</u>   | <u>Year 2</u>   | <u>Year 3</u>   |
|-------------------|-----------------|-----------------|-----------------|
| Research Contract | <u>\$50,000</u> | <u>\$40,000</u> | <u>\$40,000</u> |
| Total             | \$50,000        | \$40,000        | \$40,000        |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-N-13

2. Project Title: Identify Flood-Prone Areas for Protection of Lives and Property

3. Service-wide Issue(s):

N20 - Lack of Basic Data: Insufficient Understanding of Park Ecosystems and Threats to Them

4. Problem Statement: Important visitor attractions are found in close proximity to active floodplains. With this the case, park management is concerned that visitors and property may be at risk from flash flood hazards. There is not presently available for management's use, a flood hazard assessment which identifies the areas in MOCA that lie within the limits of selected design floods including the 'Probable Maximum Flood'. In addition, there are no mitigation recommendations, specifically applicable to the monument, which management may employ where hazards might exist.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. This option leaves the monument operating without good data on the potential flood hazard of various locations and developments in the monument. It is an unacceptable option for this reason.

b. Examine Flood Prone Areas. Conduct a thorough hydrologic evaluation to delineate and evaluate flood hazards for all areas of the monument. This prudent study would give the superintendent the information necessary to ensure that public and employee safety is being protected from unreasonable exposure to flood hazards.

6. Description of the Recommended Project or Activity: Option

b. is the recommended solution for this issue. A hydrologic investigation, designed to assess flood hazards in the monument, will include stochastic analyses of available data and on-site measurements of the channel. Flood hazard maps will be constructed which define the probable limits of flooded areas for selected design floods including the 'Probable Maximum Flood'. In companion to this assessment will be an assessment of potential means of mitigation including an evaluation of opportunities and constraints associated with each.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to at least two other projects listed in this plan. These are as follows:

MOCA-N-09 Conduct Riparian Ecosystem Research  
MOCA-N-11 Delineate and Evaluate Strategies for Wetland  
Protection

9. Funding Requirements:

|                   | <u>Year 1</u>   |
|-------------------|-----------------|
| Research Contract | <u>\$35,000</u> |
| Total             | \$35,000        |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-N-14

2. Project Title: Determine Visitor Impacts and Use Limits

3. Servicewide Issue(s):

N22 - Overuse/Impacts to Recreation and/or Landscaped Zones

4. Problem Statement: No known study of visitor impacts or use limits has yet been conducted at Montezuma Castle, even though such a study is called for in both the 1975 *Final Master Plan* and the 1976 *Cultural and Natural Resources Management Plan and Assessment*. Visitation to Montezuma Castle, the highest visitor use section of the monument, exceeded 657,000 in 1987 and has increased over 58 percent during the past five years. Although the portion of the monument containing the Castle totals nearly 600 acres, visitor use is concentrated into an area of approximately 20 acres. This area, handling as many as 4,500 people on peak days, is composed of the access road, visitor center and adjacent parking lot, sewage treatment facility, the grounds containing a picnic area and interpretive trail, and the ruin site. The current trend of rapidly increasing visitation shows no signs of slowing. Visitor overcrowding is already occurring on peak days, potentially resulting in greatly lessened quality of recreational experiences and a myriad number of resource degradation problems including those associated with visitor-oriented structures and facilities. In addition, the current on-site sewage facility (built in 1983 and brought on-line in 1984) to accommodate the anticipated continued visitation increase, is already operating at or above capacity. Severe overloading of that facility would result in the denial of monument access to visitors, stemming from the obvious threat to public health. Based on these and other related circumstances, particularly staff shortages, it is important that visitor impacts on monument resources be clearly identified and assessed, along with a determination of the maximum number of visitors that can be accommodated per day under the current limits of monument facilities and management.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. Conduct a Study of Visitor Impacts and Use Limits. A combination study of visitor impacts on monument resources, both current and anticipated, and the determination of use limits for the monument, would provide staff with definitive tools

with which to more effectively manage the heavy visitation they are experiencing. The monument, staff, and visitors would all benefit.

b. No Action. Lack of movement on these issues will surely either initiate negative visitor impacts on resources or exacerbate existing ones, and risk failure of certain support facilities. Staff are frequently overwhelmed with visitors on peak days, and visitors will inevitably receive decreasingly inferior recreational experiences.

6. Description of the Recommended Project or Activity: Option a. is the recommended solution for this issue. Conduct a study of visitor impacts and use limits as a complement to, or in conjunction with, the proposed visitor use survey. Data from the survey can be used to design and streamline the social conditions section of the visitor impacts/use limits study. This study would be designed to determine the physical, biological, environmental, and social conditions that define the monument's best recreational use. Once the ideal use conditions and use limits are established, they can be continuously updated via a long-term monitoring program.

Maximum allowable visitor use levels have not been determined for the various areas and visitor activities within the monument. In order to develop such use levels, based on quantifiable sociological and ecological data, a number of studies will be conducted. Impacted areas will be identified and information on deterioration rates, and the susceptibility of specific areas to visitor impact will be gathered. Visitor use statistics will be gathered, recorded, and analyzed on a continuing basis. Efforts will be made to identify those impacts resulting from specific visitor activities. Once impacts are identified, efforts will be made to mitigate and compensate for them in order to allow the monument's ecosystems to evolve, repair themselves, and survive in a relatively unimpeded natural state.

The information obtained from the above studies will be used to develop visitor use limit figures for the various areas and visitor activities in the monument. A use limit may also be developed for the monument as a whole. Once use limits have been established use will be held to this level. As additional information becomes available the use limit figures will be readjusted as necessary.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to at least one other project listed in this plan. This is as follows:

MOCA-N-10 Conduct Visitor Use Survey

9. Funding Requirements:

|                     | <u>Year 1</u> |
|---------------------|---------------|
| Data Collection     | \$ 4,500      |
| Data Analysis       | 4,500         |
| Travel and Per Diem | 1,000         |
| Publication Costs   | <u>800</u>    |
| Total               | \$10,800      |

(Costs are for a one year, in-house (CPSU) study using one or more NPS Research Scientists and a GS-5 graduate student; assumes computer requirements already satisfied and no use of outside, paid consultants)

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-N-15

2. Project Title: Conduct Inventory and Assessment:  
Vegetation and Flora

3. Servicewide Issue(s):

N20 - Lack of Basic Data: Insufficient Understanding of Park  
Ecosystems and Threats to Them

4. Problem Statement: This project will consist of a botanical RBI of the Castle and Well Units to provide new information for management and interpretation. It will also involve the design of long-term monitoring protocols for selected components of this ecosystem. Vegetation is the keystone of natural ecosystems, serving as a basis for animal life and as a synthesizer of environmental factors, including geology, soils, slope, exposure, and climate. Thus, vegetational analyses can be used as a tool for examining potential environmental problems. The baseline monitoring established by this study will allow managers to assess such factors as changes in alien plant species and communities, changes in surface and groundwater regimes, and stability or lack of stability in plant communities, e.g. sycamores in the castle section, a problem discussed in the 1975 *Cultural and Natural Resources Management Plan and Environmental Assessment*.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. Conduct Vegetation and Flora Inventory and Assessment. This will increase management's ability to assess changes in the natural resources of the monument. Close monitoring of the vegetation and flora can serve as an early warning system for undesirable changes and increase management's ability to respond effectively to these changes in a timely manner. Additional botanical information will be provided for interpretive programs.

b. Conduct Vegetation Inventory and Assessment Only. This will assist management in monitoring long time environmental changes in the monument environment but will not allow early detection of such problems as invasion of alien species.

c. Conduct Flora Inventory and Assessment Only. This will assist management in detecting undesirable changes, e.g. invasion of alien plant species, but will not provide adequate

vegetational information to serve as an effective early warning system for undesirable changes in the monument's environment.

d. No Action. This will leave management vulnerable to being unable to detect changes in the vegetation and flora, thus also related changes, e.g. in flow levels of surface or groundwater. Additional information for interpretation of botanical parameters will not be forthcoming.

6. Description of the Recommended Project or Activity: Option a. is the recommended solution for this issue. The project will consist of two basic components: a) inventory and assessment of the flora, b) inventory and assessment of the vegetation, and c) design of a long-term monitoring program for these ecological factors. Vegetation is composed of plant communities, e.g. desertscrub or mixed riparian woodland, and is the keystone of natural ecosystems, serving as a basis for animal life and as a synthesizer of environmental factors, including geology, soils, slope, exposure, and climate. Vegetation, in turn, is made up of the collective plant species of the monument, or flora. Data will be collected concerning the distribution, composition, structure, evolution, and aerial extent of vegetation. The monument currently has an extensive herbarium which contains specimens of 646 species and subspecies. A basic botanical survey, description, and synthesis of existing and new information will be completed, adding new information from the project to the information now contained in the herbarium and monument files. Researchers will provide information which will upgrade interpretation of the monument's flora and vegetation.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to at least ten other project listed in this plan. This is as follows:

|           |                                                                                                |
|-----------|------------------------------------------------------------------------------------------------|
| MOCA-N-09 | Conduct Riparian Ecosystem Research                                                            |
| MOCA-N-16 | Conduct Inventory and Assessment: Invertebrates                                                |
| MOCA-N-17 | Conduct inventory and Assessment: Amphibians and Reptiles                                      |
| MOCA-N-18 | Conduct inventory and Assessment: Birds                                                        |
| MOCA-N-19 | Conduct inventory and Assessment: Soils                                                        |
| MOCA-N-20 | Conduct inventory and Assessment: Mammals                                                      |
| MOCA-N-21 | Conduct inventory and Assessment: Non-native Species                                           |
| MOCA-N-24 | Evaluate Effects of Hydrologic Characteristics on Regeneration of Vegetation in Riparian Areas |

MOCA-N-25 Conduct inventory and Assessment: Fishes  
 MOCA-I-04 Develop Bibliographic Assessment and Computerized  
 Bibliographic Information Retrieval System  
 MOCA-I-05 Integrate Program for Long-Term Monitoring of  
 Cultural and Natural Resources

9. Funding Requirements:

|                        | <u>Year 1</u> | <u>Year 2</u> | <u>Year 3</u> |
|------------------------|---------------|---------------|---------------|
| Personal Services      | \$ 6,000      | \$ 6,000      | \$ 6,000      |
| Travel and Per Diem    | 1,300         | 1,300         | 800           |
| Equipment and Supplies | 200           | 200           | 700           |
| Publication Costs      | <u>0</u>      | <u>0</u>      | <u>600</u>    |
| Total                  | \$7,500       | \$7,500       | \$8,100       |

First Year: Begin collection and identification of flora of Castle and Well units during all four seasons.

Second Year: Continue collection and identification of flora during all four seasons. Start classification of vegetational communities.

Third Year: Finish collection and identification of flora. Design monitoring protocols. Prepare reports for resources management and interpretive programs. Provide management alternatives and projected results of management actions. Train monument staff on implementation of monitoring protocols.

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-N-16

2. Project Title: Conduct Inventory and Assessment:  
Invertebrates

3. Servicewide Issue(s):

N20 - Lack of Basic Data: Insufficient Understanding of Park  
Ecosystems and Threats to Them

4. Problem Statement: The invertebrates are a large and diverse group of animals occupying terrestrial and aquatic environments at Montezuma Castle and Montezuma Well. The vast number of species and difficulties of identifying specimens make invertebrates relatively difficult to study. Nonetheless, they are responsible for a number of vital ecosystem functions. The best known groups of invertebrates are members of the Classes Insecta, Crustacea and Mollusca. Many members of these groups are known because they are economically and medically important as pests. However, the description of species new to science is not atypical among workers specializing in a particular Family or Genus of insect, crustacean or mollusk. It is highly probable that tens of taxa in these three groups remain undescribed in the Well and Castle.

There are no known impacts on health and public safety; however, a number of insects, ticks, and other invertebrates are known to cause debilitating and life-threatening diseases. Biting insects such as bees and wasps may also threaten hyper-allergic people.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. This alternative entails maintenance of the status quo. No research on native invertebrates would be undertaken.

b. Conduct an Inventory and Assessment of the Existing Invertebrates. This alternative calls for an inventory and assessment of the invertebrates of Montezuma Castle National Monument. It also entails the design of long-term monitoring protocols for these components of the ecosystem. The project should be phased to concentrate on Families or Orders of invertebrates. Specific taxonomic groups to be inventoried

should include those that are preserved and studied easily. Protozoans, although of interest and importance in the monument could only be studied cost-effectively on a very limited scale. This is true of other groups such as the Platyhelminthes and nematode worms as well. A few specialists would be available world-wide to study some groups of invertebrates. The studies should be designed to sample the biotic diversity of insects, crustaceans, mollusks and other better known groups of invertebrates. Organisms occupying different environments (i.e., aquatic or terrestrial) will probably be studied most effectively by different specialists.

6. Description of the Recommended Project or Activity: Option b. is the recommended solution for this issue. Conduct an inventory and assessment of the native invertebrates at Montezuma Castle. This effort should initially concentrate on insects, crustaceans, mollusks and other relatively well known groups. Inventories should also be defined by habitats. A variety of collecting techniques should be used to effectively sample the diversity of invertebrates and their habitats. A seasonal sampling regime would allow the researcher to make initial determinations of relative abundance, reproductive strategies, and other natural history attributes. The inventories should be implemented with a comprehensive review of pertinent literature. Data should be analyzed using simple descriptive statistics (e.g., mean, standard deviation, etc.) and the entire set should be presented to NPS. The research should also develop recommendations for subsequent studies which may provide information having management significance. Studies during the last two years of the project should concentrate on taxa of management concern or exceptional scientific interest. Further, a long-term monitoring program for these invertebrates should also be designed and protocols developed. Monument staff should also be trained in the implementation of these protocols.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to at least ten other projects listed in this plan. These are as follows:

|           |                                                   |                                              |
|-----------|---------------------------------------------------|----------------------------------------------|
| MOCA-N-15 | Conduct inventory and Assessment:                 | Vegetation and Flora                         |
| MOCA-N-17 | Conduct inventory and Assessment:                 | Amphibians and Reptiles                      |
| MOCA-N-18 | Conduct inventory and Assessment:                 | Birds                                        |
| MOCA-N-19 | Conduct inventory and Assessment:                 | Soils                                        |
| MOCA-N-20 | Conduct inventory and Assessment:                 | Mammals                                      |
| MOCA-N-21 | Conduct inventory and Assessment:                 | Non-native Species                           |
| MOCA-N-24 | Evaluate Effects of Hydrologic Characteristics on | Regeneration of Vegetation in Riparian Areas |
| MOCA-N-26 | Conduct inventory and Assessment:                 | Fishes                                       |
| MOCA-I-04 | Develop Bibliographic Assessment and Computerized | Bibliographic Information Retrieval System   |
| MOCA-I-05 | Integrate Program for Long-Term Monitoring of     | Cultural and Natural Resources               |

9. Funding Requirements:

|                        | <u>Year 1</u> | <u>Year 2</u> | <u>Year 3</u> |
|------------------------|---------------|---------------|---------------|
| Personal Services      | \$10,500      | \$10,500      | \$10,500      |
| Supplies and Materials | 500           | 500           | 500           |
| Travel and Per Diem    | 500           | 500           | 500           |
| Publication Costs      | <u>0</u>      | <u>0</u>      | <u>800</u>    |
| Total                  | \$11,500      | \$11,500      | \$12,300      |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-N-17

2. Project Title: Conduct Inventory and Assessment:  
Amphibians and Reptiles

3. Service-wide Issue(s):

N20 - Lack of Basic Data: Insufficient Understanding of Park  
Ecosystems and Threats to Them

4. Problem Statement: Both upland and riparian amphibians and reptiles will be studied. These animals are commonly the most poorly understood of the vertebrate species in an area. Since they are poikilothermous ("cold-blooded") they are easily affected by slight changes in temperature, as between shady and sunny microhabitats, thus are probably the most reliable vertebrate indicators of habitat change. In addition, many species require moist habitats, during parts or all of their life cycles, especially amphibians such as frogs and toads. Although changes in riparian ecosystems have resulted in severe reductions in species diversity and population densities for many plant and animal species, the impacts of these riparian habitat losses on amphibians and reptiles have not been as well documented as for birds. Venomous reptiles such as rattlesnakes constitute a safety hazard for visitors and their distribution needs to be better understood. Understanding distribution and relative stability of amphibian and reptile species is thus an important element of vertebrate biology in relation to resource management and interpretation. A long-term monitoring program for these components of the ecosystem is also needed.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. Conduct Biological Inventory and Assessment of Amphibians and Reptiles. This will provide additional information to aid the management in maintaining biological diversity in the monument as well as providing information for interpretive exhibits and presentations. Design long-term monitoring protocols for these components of the ecosystem.

b. No Action. Information that would assist in monitoring of environmental changes and changes in biological diversity will not be available for resource managers or for interpretation to the visiting public.

6. Description of the Recommended Project or Activity: Option a. is the recommended solution for this issue. Species richness and relative densities for amphibians and reptiles in the monument will be determined. Species that have specialized requirements that are of interest to interpretive programs or resource management problems will be studied in relationship to those requirements. A field checklist will be produced. A long-term monitoring program will be designed and the monument staff trained in the implementation of these protocols.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to at least eleven other projects listed in this plan. These are as follows:

|           |                                                                                                |
|-----------|------------------------------------------------------------------------------------------------|
| MOCA-N-09 | Conduct Riparian Ecosystem Research                                                            |
| MOCA-N-15 | Conduct inventory and Assessment: Vegetation and Flora                                         |
| MOCA-N-16 | Conduct Inventory and Assessment: Invertebrates                                                |
| MOCA-N-18 | Conduct inventory and Assessment: Birds                                                        |
| MOCA-N-19 | Conduct inventory and Assessment: Soils                                                        |
| MOCA-N-20 | Conduct inventory and Assessment: Mammals                                                      |
| MOCA-N-21 | Conduct inventory and Assessment: Non-native Species                                           |
| MOCA-N-24 | Evaluate Effects of Hydrologic Characteristics on Regeneration of Vegetation in Riparian Areas |
| MOCA-N-26 | Conduct inventory and Assessment: Fishes                                                       |
| MOCA-I-04 | Develop Bibliographic Assessment and Computerized Bibliographic Information Retrieval System   |
| MOCA-I-05 | Integrate Program for Long-Term Monitoring of Cultural and Natural Resources                   |

9. Funding Requirements:

|                        | <u>Year 1</u> | <u>Year 2</u> | <u>Year 3</u> |
|------------------------|---------------|---------------|---------------|
| Personal Services      | \$6,500       | \$6,500       | \$6,500       |
| Travel and Per Diem    | 1,800         | 1,800         | 1,300         |
| Equipment and Supplies | 500           | 500           | 300           |
| Publication Costs      | 0             | 0             | 700           |
| Total                  | \$8,800       | \$8,800       | \$8,700       |

First Year: Initiate field aspects of project.

Second Year: Continue project with emphasis on rare and poorly known species identified in the first year.

Third Year: Finish field work and prepare final report. Produce field checklist. Design long-term monitoring program. Train monument staff on implementing protocols.

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-N-18

2. Project Title: Conduct Inventory and Assessment:  
Birds

3. Servicewide Issue(s):

N20 - Lack of Basic Data: Insufficient Understanding of Park  
Ecosystems and Threats to Them

4. Problem Statement: Changes in riparian and adjacent upland ecosystems, such as those at Montezuma Castle, have resulted in severe reductions in avian species diversity and population densities through most of the Southwest. Important attributes of birds include diurnal activity, songs and prominent displays, and the interest of a large number of people in birdwatching. These factors have provided an information base generally making the avifauna one of the best tools for evaluating the biological health of an ecosystem. Montezuma Castle and Well have been maintained in relatively pristine conditions since establishment of the monument in 1906 and addition of the well in 1943. Still, reconstruction of the earlier biological landscapes of the area from journals of earlier explorers and residents and through comparison of modern photos with old photos indicate that even these areas were heavily impacted by the end of the 20th century. Activities that reduced and modified the extensive riparian and adjacent upland vegetative communities, and presumably the dependent avifauna, included trapping of beavers and destruction of their dams, overgrazing, and surface water withdrawal. This project is designed to supplement the basic avifaunal information contained in the monument files by providing more information about the interaction of key avian species (indicator species) with the rest of the monument environment. It is also designed to provide a long-term monitoring program for these components of the ecosystem.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. Conduct Avian Biological Inventory and Assessment. This study will provide information that can serve as an additional management tool for examining the ecological health of the monument, especially riparian ecosystems, including the examination of the problem of decreasing tree vigor in the sycamore forest (which was discussed in both the 1975 *Cultural and Natural Resources Management Plan* and *Environmental*

Assessment). Interpretive information about the avifauna will be made available for visitors. The Principal Investigator will also design a long-term monitoring protocols for the avian components of the ecosystem.

b. No Action. Problems which need to be addressed, such as those in the mixed riparian deciduous forest, that need information from these avian studies will continue to exist. Additional information about birds for interpretive programs will not be forthcoming.

6. Description of the Recommended Project or Activity: Option a. is the recommended solution for this issue. Species richness and relative densities for avian species will be examined. Species that have specialized requirements that are related to interpretive programs or resource management problems will be studied in relationship to those requirements. An annotated checklist of Castle and Well birds suitable for sale at the visitor center will be produced in conjunction with birds of Tuzigoot. A long-term monitoring program will be designed for these components of the ecosystem. The monument staff will be trained in the implementation of these protocols.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to at least eleven other projects listed in this plan. These are as follows:

|           |                                                                                                |
|-----------|------------------------------------------------------------------------------------------------|
| MOCA-N-09 | Conduct Riparian Ecosystem Research                                                            |
| MOCA-N-15 | Conduct inventory and Assessment: Vegetation and Flora                                         |
| MOCA-N-16 | Conduct Inventory and Assessment: Invertebrates                                                |
| MOCA-N-17 | Conduct inventory and Assessment: Amphibians and Reptiles                                      |
| MOCA-N-19 | Conduct inventory and Assessment: Soils                                                        |
| MOCA-N-20 | Conduct inventory and Assessment: Mammals                                                      |
| MOCA-N-21 | Conduct inventory and Assessment: Non-native Species                                           |
| MOCA-N-24 | Evaluate Effects of Hydrologic Characteristics on Regeneration of Vegetation in Riparian Areas |
| MOCA-N-26 | Conduct inventory and Assessment: Fishes                                                       |
| MOCA-I-04 | Develop Bibliographic Assessment and Computerized Bibliographic Information Retrieval System   |
| MOCA-I-05 | Integrate Program for Long-Term Monitoring of Cultural and Natural Resources                   |

9. Funding Requirements:

|                        | <u>Year 1</u> | <u>Year 2</u> | <u>Year 3</u> |
|------------------------|---------------|---------------|---------------|
| Personal Services      | \$6,500       | \$6,500       | \$6,500       |
| Travel and Per Diem    | 2,000         | 2,000         | 1,000         |
| Equipment and Supplies | 500           | 500           | 200           |
| Publication Costs      | <u>0</u>      | <u>0</u>      | <u>800</u>    |
| Total                  | \$9,000       | \$9,000       | \$8,500       |

First Year: Begin avian studies for species richness and relative densities.

Second Year: Continue avian studies as first year plus select indicator species and special status species (rare, declining or increasing populations, etc.).

Third Year: Finish field work, write up studies, prepare interpretive information, prepare annotated checklist in conjunction with Tuzigoot. Long-term monitoring protocols will be designed and the monument staff trained in their implementation.

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-N-19

2. Project Title: Conduct Survey and Assessment: Soils

3. Servicewide Issue(s):

N20 - Lack of Basic Data: Insufficient Understanding of Park Ecosystems and Threats to Them

4. Problem Statement: The soils of Montezuma Castle National Monument have never been surveyed or mapped. No site specific information exists that can be used by the superintendent to make informed decisions regarding management of pastures and open fields on prehistoric agricultural lands within the monument, siting of visitor use facilities, protection of cultural sites and critical habitats, and prevention of soil erosion. This project will also develop data for the monument's geographic information system, and provide baseline information useful in integrating other ecological studies performed at the Montezuma Castle. The study is also designed to provide a long-term monitoring program for this component of the ecosystem.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. This alternative will force the superintendent to continue to manage the monument without a general soils map and the attendant information a soil survey provides. Better information makes for better management. This no action alternative may well leave the superintendent out of compliance with laws and regulations governing protection of antiquities, water quality, historic landscapes, and visitor safety.

b. Conduct a Soil Survey. The information resulting from this survey will contribute significantly to allowing the Superintendent to manage the monument resources, both cultural and natural, from a solid basis. Visitor services facilities can be located in areas of stable soils, areas of high erosive potential can be delineated and protected from human impacts, management requirements for the prehistoric agricultural fields can be scientifically developed, and information on soils, which often are a major ecological controlling factor, can be made available to researchers working on other park problems, thus enhancing their ability to draw solid conclusions from their data bases. The Principal Investigator will also design a long-term monitoring protocols for the soils of the monument.

6. Description of the Recommended Project or Activity: Option b. is the recommended solution for this issue. The recommended alternative is to conduct a soil survey. The Soil Conservation Service, the U.S. Forest Service, a university researcher, or a private consultant should be funded to conduct a level III soil survey. This project can be conducted independent of any other project underway or planned for the monument. Products of this survey should include a detailed soils map, soil series descriptions, and an assessment of the significant properties of these soils as related to cultural site preservation, prehistoric landscape scene preservation, ecological protection, and visitor services development.

This project will first require that low level black and white aerial photography be taken of the monument. Once the photography has been acquired, approximately two person-weeks of office work with the aerial photographs will be needed to delineate soil associations on a preliminary working map. Following this work, approximately two person-weeks onsite will be required to ground truth and refine the preliminary map. Following the field work, approximately two person-months will be needed in the office to finalize the maps, prepare the soil series descriptions, prepare an assessment of soil properties relative to managing Montezuma Castle National Monument, and write the final report. A draft final report should be ready for NPS review within three person-months of project initiation. A long-term monitoring program will be designed for the soils of the monument. The monument staff will be trained in the implementation of these protocols.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to at least four other projects listed in this plan. These are as follows:

|           |                                                                                                |
|-----------|------------------------------------------------------------------------------------------------|
| MOCA-N-14 | Determine Visitor Impacts and Use Limits                                                       |
| MOCA-N-24 | Evaluate Effects of Hydrologic Characteristics on Regeneration of Vegetation in Riparian Areas |
| MOCA-I-04 | Develop Bibliographic Assessment and Computerized Bibliographic Information Retrieval System   |
| MOCA-I-05 | Integrate Program for Long-Term Monitoring of Cultural and Natural Resources                   |

This project is a baseline effort that also supports all other Montezuma Castle National Monument projects that are concerned with ecological components or cultural scene preservation.

9. Funding Requirements:

|                     |            |
|---------------------|------------|
| Personal Services   | \$ 9,000   |
| Aerial Photography  | 2,000      |
| Travel and Per Diem | 2,000      |
| Publication Costs   | <u>900</u> |
| Total               | \$13,900   |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-N-20

2. Project Title: Conduct Inventory and Assessment:  
Mammals

3. Servicewide Issue(s):

N20 - Lack of Basic Data: Insufficient Understanding of Park  
Ecosystems and Threats to Them

4. Problem Statement: Changes in riparian and upland ecosystems have resulted in species composition and population densities through most of mammals in the Southwest. Some mammalian species are of interest because of recreational pursuits (i.e., hunting), others because they are disease vectors, and still others because they cause economic losses. The majority of mammalian species are poorly known by land managers, wildlife managers and the general public. Montezuma Castle and Well have been maintained in relatively pristine conditions since establishment of the monument in 1906 and addition of the well in 1943. Still, reconstruction of the earlier biological landscapes of the area from journals of earlier explorers and residents and through comparison of modern photos with old photos indicate that even these areas were heavily impacted by the end of the 20th century. Activities that reduced and modified the extensive riparian vegetative communities, and presumably many mammals included, trapping and predator control, grazing, conversion of plant communities and surface water withdrawal. This project is designed to supplement and develop baseline information on mammals within Montezuma Castle, providing more information about the interaction of key mammalian species (indicator species) with the rest of the monument environment, and document the biological diversity of mammals. The study is also designed to provide a long-term monitoring program for these components of the ecosystem.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. Conduct Mammalian Inventory and Assessment. This will provide information on native mammals which will serve as an additional management tool for examining the ecological health of the monument ecosystems. It will also provide information on relative abundance and natural history characteristics of species. The inventory will be conducted using non-destructive sampling techniques such as live trapping, mist netting and

observation. The contractor will be required to obtain a scientific collecting permit from the superintendent and from the State of Arizona. The Principal Investigator will also design long-term monitoring protocols for these components of the ecosystem.

b. No Action. This alternative entails maintenance of the status quo. Monument staff will rely on the existing scant database to make management decisions affecting native mammals. No research on native mammals will be conducted.

6. Description of the Recommended Project or Activity: Option a. is the recommended solution for this issue. Conduct an inventory of native mammals at Montezuma Castle, including the Montezuma Well unit. This program will document the occurrence of native mammals and their relative abundance within riparian, wetland and upland habitats. Species that have habitat requirements that are related to interpretive programs or resource management problems will be studied in relationship to those requirements. An annotated checklist suitable for sale at the visitor center will be produced. A long-term monitoring program will be designed for these components of the ecosystem. The monument staff will be trained in the implementation of these protocols.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project. The principal investigator must apply for and receive a scientific collecting permit from the Monument Superintendent. Biological specimens for museums and reference use in the Monument may be collected only when required.

8. Relationships: This project is related to at least twelve other projects listed in this plan. These are as follows:

|           |                                                                                                |
|-----------|------------------------------------------------------------------------------------------------|
| MOCA-N-09 | Conduct Riparian Ecosystem Research                                                            |
| MOCA-N-15 | Conduct inventory and Assessment: Vegetation and Flora                                         |
| MOCA-N-16 | Conduct Inventory and Assessment: Invertebrates                                                |
| MOCA-N-17 | Conduct inventory and Assessment: Amphibians and Reptiles                                      |
| MOCA-N-18 | Conduct inventory and Assessment: Birds                                                        |
| MOCA-N-19 | Conduct inventory and Assessment: Soils                                                        |
| MOCA-N-21 | Conduct inventory and Assessment: Non-native Species                                           |
| MOCA-N-24 | Evaluate Effects of Hydrologic Characteristics on Regeneration of Vegetation in Riparian Areas |

- MOCA-N-26 Conduct inventory and Assessment: Fishes
- MOCA-I-02 Prepare a Grazing Management Plan for Prehistoric Sinaguan Fields
- MOCA-I-04 Develop Bibliographic Assessment and Computerized Bibliographic Information Retrieval System
- MOCA-I-05 Integrate Program for Long-Term Monitoring of Cultural and Natural Resources

9. Funding Requirements:

|                        | <u>Year 1</u> | <u>Year 2</u> | <u>Year 3</u> |
|------------------------|---------------|---------------|---------------|
| Personal Services      | \$6,500       | \$6,500       | \$6,500       |
| Travel and Per Diem    | 1,000         | 1,000         | 700           |
| Supplies and Materials | 800           | 800           | 300           |
| Publication Costs      | <u>0</u>      | <u>0</u>      | <u>800</u>    |
| Total                  | \$8,300       | \$8,300       | \$8,300       |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-N-21
2. Project Title: Inventory, Assess, and Evaluate Control of Non-native Species
3. Service-wide Issue(s):
  - N20 - Lack of Basic Data: Insufficient Understanding of Park Ecosystems and Threats to Them
  - N04 - Degradation of Park Resources Due to Non-Native Animals
  - N05 - Degradation of Park Resources Due to Non-Native Plants
4. Problem Statement: The National Park Service is aware of some non-native species that occur at Montezuma Castle National Monument. Less is known, however, about their abundance, distribution, and population trends. Lacking an inventory, it is likely that additional introduced species occur in the monument but have not yet been detected. Some problems perhaps have not yet been identified because of their subtlety. For example, a non-native insect(s) might compete with and replace a native insect which is essential (a symbiotic partner) in pollinating a native plant. An example is the European honey bee now colonizing niches in the cliffs. The Africanized bee is expected within three to five years.

However, some non-native species problems have been identified. Salt cedar, a shrub or small tree, is invading the Verde Valley and is spreading into riparian habitats at Montezuma Castle. Other introduced plants displaying differing aggressiveness on a case by case basis include Russian thistle, Russian olive, horehound, woolly mullein, puncturevine, filaree, red brome and bermuda grass. Several plants have been introduced to Montezuma Castle and Montezuma Well as a result of past settlement, grazing, farming, excavation and construction in and around these areas. Cheatgrass, wild barley and foxtail keenly invade from grazed to ungrazed lands. Arizona Department of Transportation commonly sows Lehmann lovegrass along highways. This species was used in the monument by NPS when the entrance road was improved.

Known introduced animals at Montezuma Castle include house sparrow, rock dove and starlings. Starlings are known to aggressively replace native primary and secondary cavity nesting bird species. Others include feral cats and dogs. In aquatic habitats, non-natives represented include bullfrog, eastern box turtle, and fishes, i.e., rainbow trout, brown trout, smallmouth bass, mosquitofish, green sunfish, carp and black bullhead. The

Asiatic clamd once infested the irrigation ditch at the Well unit. Control treatments were used and now it seems to be completely removed. However, its larvae are aggressive colonizers and the species is still abundant throughout the Verde Valley. Consequently, the ditch is cleaned a couple times a year to monitor for clams as well as maintain the flow.

A need exists to develop a long-term monitoring program for these components of the ecosystem. This study is designed to provide the protocols for this monitoring program.

#### 5. Alternative Actions/Solutions and Their Probable Impacts:

a. Inventory and Assess Non-native Species then Control where Practicable. Inventorying introduced species, their distribution, abundance, and seasonal occurrence, is necessary to understand the extent of the problems. With this information, management can determine which species need to be controlled and which will be tolerated. Some species may be very abundant and widespread, characteristics that make removal infeasible. Staff will also become aware of situations outside the monument which could affect lands under their jurisdiction (e.g., roadside seeding, farming, grazing, development).

Without the inventory, gradual or rapid expansion of non-native species and damage will remain unknown. Natural communities will be altered in some cases. The NPS management policies require removal of non-native species where control is practicable. Recommendations are needed regarding feasibility of eliminating these species and, where appropriate, establishing natives.

The Principal Investigator will also design long-term monitoring protocols for these components of the ecosystem.

b. Maintain Current Non-native Species Control Program. Current and past treatment of non-native species has been sporadic and infrequent, and usually not timed correctly to remove species. However, one success has been the apparent removal of Asiatic clams previously mentioned. Monument staff has used bee keepers to remove European honey bees in close proximity to visitors at the Castle. An on-going contracted plant survey at Montezuma Castle and Montezuma Well will provide some preliminary information on alien plants but it is not an extensive survey.

Lacking a thorough species inventory with recommendations for control strategies, little can be done to control or eliminate those introduced species most practicable to remove. Ecosystem alteration occurs with non-native species present. Some of the ecosystem changes probably are not irreversible but without baseline information about alien species, resource managers can only use intuition and speculate on outcomes.

c. No Action. This option abrogates the NPS responsibility to protect naturally functioning ecosystems from alien influences. It is therefore unacceptable.

6. Description of the Recommended Project or Activity: Option a. is the recommended solution for this issue. Three phases will be involved with the project execution. These phases are as follows:

Complete an inventory of non-native plants and animals. Describe their distribution, abundance, population trends, and relative treat. Categorize these into species that are not aggressive and aggressive, which actually or potentially cause the greatest ecosystem change or loss of native biotic diversity.

Develop management guidelines with control feasibility and cost evaluations for the highest priority and most threatening introduced species. Include basic information on distribution, rate of spread, etc. Historic aerial and ground photographs may be useful for these determinations. The literature should be thoroughly reviewed to determine what is known about the ecology of these species. Available management, i.e., control, using Integrated Pest Management techniques should be recommended, or if unavailable, control strategies associated with re-establishment of native species should be recommended, where appropriate. Such strategies might include physical removal or barrier experiments, use of herbicides or insecticides, biological control or some combination thereof. Consultations should be held with other specialists, as required, to develop sound strategies. Experimental treatment plots should be established, where appropriate, and records kept of activities. Success/failure of the treatment methodologies should be monitored during the course of the study. Monument personnel should be trained to carry out long-term monitoring of test plots, if appropriate.

A scientific report would be prepared that provides the superintendent with results from the inventory and evaluations with a management plan or manual for removing the most crucial non-native plant and animal species. Finally, provide written material and recommendations for applicability of findings to the interpretive program of the Monument. Proper explanation to the public of the problem and solution can develop public support and perhaps even participation in the removal program.

A long-term monitoring program will be designed for these components of the ecosystem. The monument staff will be trained in the implementation of these protocols.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to at least eighteen other projects listed in this plan. These are as follows:

MOCA-N-01 Manage Pest Species  
MOCA-N-02 Manage Vegetation: Rehabilitation, Landscaping, and Hazard Tree Removal  
MOCA-N-06 Analysis of Adjacent Land Use and Status  
MOCA-N-07 Inventory the Basic Natural Resources of Montezuma Well and Adjacent Riparian and Terrestrial Habitat  
MOCA-N-09 Conduct Riparian Ecosystem Research  
MOCA-N-15 Conduct inventory and Assessment: Vegetation and Flora  
MOCA-N-16 Conduct Inventory and Assessment: Invertebrates  
MOCA-N-17 Conduct inventory and Assessment: Amphibians and Reptiles  
MOCA-N-18 Conduct inventory and Assessment: Birds  
MOCA-N-19 Conduct inventory and Assessment: Soils  
MOCA-N-20 Conduct inventory and Assessment: Mammals  
MOCA-N-22 Examine Old Fields  
MOCA-N-24 Evaluate Effects of Hydrologic Characteristics on Regeneration of Vegetation in Riparian Areas  
MOCA-N-26 Conduct inventory and Assessment: Fishes  
MOCA-C-17 Maintain Stabilized Prehistoric Ruins  
MOCA-I-02 Prepare a Management Plan for Prehistoric Sinagua Fields  
MOCA-I-04 Develop Bibliographic Assessment and Computerized Bibliographic Information Retrieval System  
MOCA-I-05 Integrate Program for Long-Term Monitoring of Cultural and Natural Resources

9. Funding Requirements:

|                        | <u>Year 1</u> | <u>Year 2</u> |
|------------------------|---------------|---------------|
| Personal Services      | \$10,000      | \$11,000      |
| Travel and Per Diem    | 2,000         | 2,000         |
| Supplies and Materials | 2,000         | 1,000         |
| Publication costs      | 0             | 800           |
| Total                  | \$14,000      | \$14,800      |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-N-22

2. Project Title: Examine Old Fields

3. Servicewide Issue(s):

N08 - Loss of Cultural Landscapes

4. Problem Statement: Several sites within Montezuma Castle and Montezuma Well were farmed both prehistorically and historically. Currently in the monument, one pasture is lightly grazed for the purpose of maintaining a water rights and to interpret prehistoric agricultural fields. Information is lacking about the old fields in this vegetation complex of riparian zone and adjacent mesquite benches. Park management's interest is for both cultural and natural reasons. In the cultural sense, questions arise about where were the prehistoric fields and the irrigation channels? What type of farming was done and crops grown? In the natural sense, questions pertain to the successional trends from cropland and grazed pasture to eventual native vegetation. What weed species accompanied the agricultural use and which still are present? What are the stages of succession, i.e., what vegetation transitions occur? Will they, if left undisturbed, return to the natural vegetation community given factors such as soil and contour manipulation?

By having answers to these questions, park management can determine appropriate objectives and implement actions for these sites in context with park purposes. For example, discussions have been held whether to develop a demonstration prehistoric garden. Also, if water rights are secure, whether to maintain grazing to keep an open scene or else use other techniques of mowing or burning? The assessment of management options can be best made with understanding the past uses, the current conditions, the vegetative trends that have occurred, and the ultimate vegetation community if left undisturbed.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. This alternative means not examining old fields to determine the vegetative trends and not studying the prehistoric and historic agricultural uses. Park management would continue operating with a lack of knowledge about the natural and cultural aspects of old fields. The result would be to limit options.

b. Examine Old Fields. This action would be conducting a study of the prehistoric and historic uses of agricultural lands in the monument, studying the current vegetation condition and any consumptive uses, and project successional trends.

6. Description of the Recommended Project or Activity: Option b. is the recommended solution for this issue. Studying prehistoric and historic uses can be done as a historic resources study using information from ethnobotanists, archeologists, and historians and their records and writings. More historical information can be gathered from local people. This report will describe what is known about current and past uses and will provide the ground work for examining vegetation trends.

There is one pasture currently being lightly grazed by cattle in the Montezuma Well unit. Additionally, there are other abandoned fields that now contain weeds and an open woodland formation of mesquite. Cottonwood trees have been planted in one abandoned field to provide shade for a possible extension of the picnic area.

At the Castle, the alluvial flats along the creek, which are believed to be prehistoric farm land, are now mesquite thickets. Vegetation plots in these sites coupled with soils data and available information about past uses will determine successional trends.

The goal is to describe the vegetative trends to give management more options in maintaining or recreating natural and cultural settings.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to at least six other projects listed in this plan. These are as follows:

|           |                                                                                              |
|-----------|----------------------------------------------------------------------------------------------|
| MOCA-N-21 | Inventory and Evaluate Control of Alien Species                                              |
| MOCA-C-08 | Study Montezuma Castle Irrigation System                                                     |
| MOCA-C-13 | Archeological Overview and Assessment                                                        |
| MOCA-I-02 | Prepare a Grazing Management Plan for Prehistoric Sinaguan Fields                            |
| MOCA-I-04 | Develop Bibliographic Assessment and Computerized Bibliographic Information Retrieval System |
| MOCA-I-05 | Integrate Program for Long-Term Monitoring of Cultural and Natural Resources                 |

9. Funding Requirements:

|                        | <u>Year 1</u> |
|------------------------|---------------|
| Personal Services      | \$6,000       |
| Travel and Per Diem    | 1,000         |
| Aerial Photography     | 1,000         |
| Supplies and Materials | 400           |
| Publication Costs      | <u>800</u>    |
| Total                  | \$9,200       |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-N-23
2. Project Title: Evaluate Effects of Hydrologic Characteristics on Morphological Properties of Flowing Streams

3. Service-wide Issue(s):

N12 - Alteration of Natural Flow Regimes/Groundwater Levels

4. Problem Statement: The channel features found in MOCA streams (Beaver Creek and Wet Beaver Creek) are associated with water-related resource attributes such as the historic setting and the rationale for early habitation at the site. These measurable features can be dramatically altered through human-induced changes in the hydrologic regime (amount, duration, and timing of discharges). Alterations of this kind may affect existing channel form in such a way as to severely compromise site integrity and thereby diminish scientific values for scholars and the recreational and interpretive values for visitors.

The potential for changes in sediment and hydrologic regimes arises from mining, upstream diversions, and/or storage. Changes in existing diversion and storage arrangements are likely to occur as population pressure increases in this geographic area. Therefore, the alterations in channel form could arise in the near future if they have not already. In either case, the NPS presently lacks the data describing existing or potential impacts which could be used in litigation aimed at preventing or providing remedy for adverse effects of this kind.

5. Alternative Actions/Solutions and their Probable Impacts:

- a. No Action. Continue to operate the monument without any type of hydrologic evaluation. This deprives the interpretive program of information relative to the relationship between the presence of the flowing streams and implications for life during the prehistoric occupation period. The effects of external activities on water quantity, quality, sediment load, and flood hazard will remain unknown.

- b. Study Effects of Hydrologic Characteristics. Thoroughly evaluate hydrologic effects on morphological characteristics of flowing streams in Montezuma Castle National Monument. Develop a

mathematical model for such characteristics to assist the superintendent in protecting water rights, evaluating the potential effects of proposed upstream land developments, etc.

6. Description of the Recommended Project or Activity: Option b. is the recommended solution for this issue. An evaluation of hydrologic effects upon morphological characteristics of flowing streams from changes in hydrologic regimes will require the characterization of existing hydrology, channel features, sediment transport, as well as the modelling of existing and potential flow regimes. The collection of discharge and sediment data will be accompanied by the characterization of channel geometry, bed material, and depositional forms. Standard approaches for modelling sediment transport will be applied to existing and collected data to describe the likely future form of the channel under a set of hypothetical hydrologic regimes. Evaluation of the effects upon the historic scene, and other water-related resource attributes will be made using analytical methods as well as expert opinion.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to at least four other projects listed in this plan. These are as follows:

|           |                                                                                              |
|-----------|----------------------------------------------------------------------------------------------|
| MOCA-N-04 | Identify and Inventory Water-Related Resources                                               |
| MOCA-N-05 | Evaluate Water Delivery Monitoring System                                                    |
| MOCA-N-13 | Identify Flood-Prone Areas for the Protection of Lives and Property                          |
| MOCA-I-04 | Develop Bibliographic Assessment and Computerized Bibliographic Information Retrieval System |

9. Funding Requirements:

|                   | <u>Year 1</u>   | <u>Year 2</u>   |
|-------------------|-----------------|-----------------|
| Research Contract | <u>\$30,000</u> | <u>\$10,000</u> |
| Total             | \$30,000        | \$10,000        |

Year one will be used to conduct the field study. Year two will be used to complete the data analysis and report preparation.

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-N-24

2. Project Title: Evaluate Effects of Hydrologic Characteristics on Regeneration of Vegetation in Riparian Areas

3. Servicewide Issue(s):

N12 - Alteration of Natural Flow Regimes

4. Problem Statement: Riparian vegetation at Montezuma Castle is a water-related resource attribute of specific concern to management. Many riparian plants have regeneration requirements which are related to the normal periodicity of over-bank discharges. Elimination of these discharges or a change in their periodicity may adversely affect vegetation replacement and the organisms dependent upon riparian vegetation. The potential for a change in over-bank flows can arise from upstream water development such as diversion and storage, or from on-site channel modifications. These effects may already exist or could arise in the future due to off-site water development or on-site human impacts.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. This option will leave the monument operating without any empirical data as to the current status of vegetative reproduction in the riparian zone, or the hydrologic factors influencing the health of this ecosystem.

b. Study Effects of Hydrologic Characteristics. Conduct an evaluation of the effects of current hydrologic characteristics on vegetation in the riparian zone at the monument. This information will be valuable to the superintendent when responding to proposed developments upstream of the monument. It will also be very helpful in evaluating the long-term prospects for riparian ecosystems in the monument.

6. Description of the Recommended Project or Activity: Option b. is the recommended solution for this issue. An evaluation of hydrologic effects on regeneration of vegetation in riparian areas will require the characterization of existing hydrology, channel features, sediment transport, and riparian vegetation, as

well as mathematical modelling of existing and potential flow regimes. The collection of discharge and sediment data will be accompanied by the mapping of floodplain areas and their associated vegetation. Standard approaches for frequency analysis will be applied to existing and collected discharge data in a modelling effort which will describe areas and frequency of inundation under existing and possible conditions of off-site water development and on-site channel modification. Evaluation of the effects on riparian vegetation and organisms dependent thereon will be made by experts using results of the above described assessment.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to at least six other projects listed in this plan. These are as follows:

|           |                                                                                               |
|-----------|-----------------------------------------------------------------------------------------------|
| MOCA-N-04 | Identify and Inventory Water-Related Resources                                                |
| MOCA-N-09 | Conduct Riparian Ecosystem Research                                                           |
| MOCA-N-11 | Delineate and Evaluate Strategies for Wetland Protection                                      |
| MOCA-N-23 | Evaluate Effects of Hydrologic Characteristics on Morphological Properties of Flowing Streams |
| MOCA-I-04 | Develop Bibliographic Assessment and Computerized Bibliographic Information Retrieval System  |
| MOCA-I-05 | Integrate Program for Long-Term Monitoring of Cultural and Natural Resources                  |

9. Funding Requirements:

|                   | <u>Year 1</u> | <u>Year 2</u> | <u>Year 3</u> |
|-------------------|---------------|---------------|---------------|
| Research Contract | \$35,000      | \$20,000      | \$20,000      |
| Total             | \$35,000      | \$20,000      | \$20,000      |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-N-25

2. Project Title: Develop a GIS System

3. Servicewide Issue(s):

N24 - Other Issues (Lack of adequate data management system)

C26 - Other (Lack of adequate data management system)

4. Problem Statement: Currently there is no automated system for creating, managing, analyzing, and displaying mapped information about the monument's resources. The monument's resources are in a continual state of change which makes it difficult to predict future resource conditions and quantify the effects from external threats. A significant challenge is faced by management when traditional methods are utilized to integrate thematic data composites derived from natural and cultural resource information. Resource management plans are by their nature limited in illustrating long term inconspicuous and subtle changes in the health of natural and cultural resources. External threat pressures from urbanization, conflicting land use practices, demographic changes, and environmental pollution are increasing at an alarming rate. A GIS system would be instrumental in detecting changes, analyzing trends, and projecting possible future conditions resulting from these external resource pressures.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. This alternative entails maintenance of the status quo. Staff would be forced to rely on traditional techniques and methods that do not illustrate long term resource changes as effectively as a GIS. Visual patterns and conditions of resources will not be generated.

b. Develop a Regional GIS System. Participate in the development of a regional NPS Geographic Information System to provide management with an effective means to analyze existing trends and predict future changes. Digitizing photographic and cartographic information will increase the speed with which staff can collect, prepare, retrieve, and manipulate data from different thematic data composites. Cartographic and subsequent data analysis, will significantly increase managements ability to document, demonstrate, illustrate, and predict long term changes

in the health of the monuments resources. In addition, the automated GIS system produces support materials such as maps, tables, charts, and graphs to illustrate the resource concerns or simply describe park resources to interested parties.

c. Develop a Stand-Alone GIS System. This is certainly a viable option in terms of technology, etc., but it would not be cost effective for an area as small as Montezuma Castle.

6. Description of the Recommended Project or Activity: Option b. is the recommended solution for this issue. An NPS Multidisciplinary GIS task force would be created to develop and standardize the GIS protocols that would be used by the monument staff. The task force would develop a strategy to address the following GIS themes: boundaries, land use, landownership, vegetation communities, riparian community stability, roads, trails, demographic influences on cultural and natural resources, and other external impacts from the surrounding area. At least two scales of resolution will be initially required to represent and generate the thematic data composites. Consideration should be given to the 1:1,200 and 1:24,000 scales for small and large scale resolution as appropriate. Physiographic and political boundaries should be adjusted to include selected natural or culture features that influence the Monuments resources. The GIS task force would be responsible for digitizing the necessary data and getting the system up and running for use by monument personnel.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is a cornerstone effort that is related to almost all other projects listed in this plan. Its purpose is to design a geographically-based data management and manipulation system for use in storing and using the results of all other studies, including maps and other georeferenced data.

9. Funding Requirements:

|                        | <u>Year 1</u> | <u>Year 2</u> | <u>Year 3</u> |
|------------------------|---------------|---------------|---------------|
| Professional Services  | \$ 5,000      | \$ 5,000      | \$ 5,000      |
| Travel & Per Diem      | 1,500         | 1,500         | 1,500         |
| Capital Equipment      | 0             | 9,500         | 1,000         |
| Digitizing/Photos      | 1,200         | 1,500         | 4,500         |
| Supplies and Materials | 800           | 500           | 500           |
| Reproductions          | <u>1,000</u>  | <u>900</u>    | <u>500</u>    |
| Total                  | \$ 9,500      | \$18,900      | \$13,000      |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-N-26

2. Project Title: Conduct Inventory and Assessment:  
Fishes

3. Servicewide Issue(s):

N20 - Lack of Basic Data: Insufficient Understanding of Park  
Ecosystems and Threats to Them

4. Problem Statement: The native fish fauna of Wet Beaver Creek and Beaver Creek has been modified by water management practices and introductions of non-native fishes. Five species of native fishes (Gila Mountain Sucker, Gila Sucker, Roundtail Chub, Speckled Dace and Longfin Dace) are known from these waters. Several species have been extirpated from Wet Beaver Creek and Beaver Creek. These are reviewed by Minckley (1973).

Native fishes have been a significant resource consideration for monument staff because of the relatively low diversity of natives, threats posed by non-native fishes, and water management practices. Arizona Game and Fish Department and U.S. Fish and Wildlife Service have conducted periodic inventories of the Wet Beaver Creek and Beaver Creek drainages. However, these efforts are generally targeting alien gamefishes. There are no known impacts on current park activities or health and safety of park employees and visitors resulting from the existing native fishery.

This study is also designed to provide a long-term monitoring program for these components of the ecosystem.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. This alternative entails maintenance of the status quo. No research on the native fishery would be undertaken. There would be no efforts to evaluate opportunities for potential re-introduction of experimental native fish populations.

b. Inventory the Existing Native Fishery. This alternative requires completion of an inventory of native fishes in Wet Beaver Creek and Beaver Creek. The inventory would be conducted using electrofishing, seining and other non-destructive sampling techniques to characterize the composition of the fishery.

Seasonal sampling would allow some insights into the relative abundance, natural history of native fishes and potential threats. Contract researchers would be retained to conduct the inventory. The contractor would be required to obtain necessary permits from the State of Arizona, U.S. Fish and Wildlife Service and NPS. The Principal Investigator will also design long-term monitoring protocols for these components of the ecosystem.

6. Description of the Recommended Project or Activity: Option b. is the recommended solution for this issue. Conduct an inventory of native fishes in Wet Beaver Creek and Beaver Creek. This research project will document the occurrence of native fish species at Montezuma Castle. A variety of collecting techniques should be used to effectively sample the diversity of aquatic habitats found (i.e. pools, runs, riffles and backwaters). A seasonal sampling regime will allow the research to make initial determinations of relative abundance, reproductive activity, length-frequency relationships within species, habitat preferences and other natural history attributes. The study effort should be initiated with a comprehensive review of the native fishery literature regarding the Beaver Creek drainage and introduction of non-native fishes. These data should be analyzed using descriptive statistics (e.g., mean, standard deviation, etc). The researcher should also develop recommendations for subsequent studies which may provide assessment level information on individual fish species having management significance. The drainages should be evaluated for opportunities to re-introduce extirpated species.

A long-term monitoring program will be designed for these components of the ecosystem. The monument staff will be trained in the implementation of these protocols.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to at least twelve other projects listed in this plan. These are as follows:

|           |                                                           |
|-----------|-----------------------------------------------------------|
| MOCA-N-06 | Analysis of Adjacent Land Use and Status                  |
| MOCA-N-09 | Conduct Riparian Ecosystem Research                       |
| MOCA-N-15 | Conduct inventory and Assessment: Vegetation and Flora    |
| MOCA-N-16 | Conduct Inventory and Assessment: Invertebrates           |
| MOCA-N-17 | Conduct inventory and Assessment: Amphibians and Reptiles |

MOCA-N-18 Conduct inventory and Assessment: Birds  
 MOCA-N-19 Conduct inventory and Assessment: Soils  
 MOCA-N-20 Conduct inventory and Assessment: Mammals  
 MOCA-N-21 Conduct inventory and Assessment: Non-native Species  
 MOCA-N-24 Evaluate Effects of Hydrologic Characteristics on  
 Regeneration of Vegetation in Riparian Areas  
 MOCA-I-04 Develop Bibliographic Assessment and Computerized  
 Bibliographic Information Retrieval System  
 MOCA-I-05 Integrate Program for Long-Term Monitoring of  
 Cultural and Natural Resources

9. Funding Requirements:

|                        | <u>Year 1</u> | <u>Year 2</u> |
|------------------------|---------------|---------------|
| Personal Services      | \$6,500       | \$6,500       |
| Travel and Per Diem    | 1,000         | 850           |
| Supplies and materials | 800           | 350           |
| Publication Costs      | <u>0</u>      | <u>500</u>    |
| Totals                 | \$8,300       | \$8,200       |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

Cultural Resources Project Statements: Funded Program

The following project statements are a description of the cultural resource protection and information program currently funded at Montezuma Castle National Monument.

## PROJECT STATEMENT

1. Project Number: MOCA-C-01

2. Project Title: Conserve Museum Objects

3. Servicewide Issue:

C15 - Need for Conservation Treatment of Museum Objects

4. Problem statement: The museum collection still at Montezuma Castle, about 140 items, has been on exhibit for almost 30 continuous years. Many of the items are organic or repaired archeological items that may be particularly fragile. A Collection Condition Survey, conducted in August of 1988, has identified objects that are in need of conservation treatment.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. Without conservation treatment these items will continue to deteriorate leading to irretrievable loss of primary resources. The park would fail to meet NPS standards.

b. Preservation and Conservation Work by Division of Conservation, Harper's Ferry Center. HFC conservators have the expertise and accommodations to do professional conservation and preservation work for any park in the system. Because all parks compete Servicewide for time and funds for these projects, objects may wait years before receiving attention now needed. In addition fragile objects would travel a considerable distance placing them in jeopardy and would be in an environment that is different and unfavorable to their preservation.

c. Preservation and Conservation Work Through Contracts With Professional Conservators. There are a few professional conservators in the southwestern area who have experience in working with the materials in the collection. The travel distance would be minimal and the environment would be relatively the same as at the park.

d. Preservation and Conservation Work by the Conservation Lab, MCR - WACC. The conservators at MCR - WACC have the expertise and accommodations to do professional conservation and preservation work for any park in their service area. Transportation to the center would be under optimal conditions. Environment at the center is similar to that of the Castle.

6. Description of the Recommended Project or Activity: Option d. is the recommended solution for this issue. Preservation and conservation of museum collections in their service area is the responsibility of the conservators at MCR - WACC. Artifacts in need of conservation would be prioritized by the Collection Condition Survey and Object Treatment Requests would be submitted by the park to the Regional Curator for approval. Conservators would treat objects following approval of the treatment proposal by the Superintendent and the Regional Curator. A treatment report, including before and after photographs, will be submitted when treated objects are returned to the park.

7. Compliance: This activity is categorically excluded under items 5 and 7, Departmental Categorical Exclusions, 516 DM Chapter 2, Appendix 1. U.S. Department of the Interior. Section 106, compliance likewise is not required for this project.

8. Relationships: This project is related to at least four other projects listed in this plan. These are as follows:

MOCA-C-02    Manage Park Museum Collection  
MOCA-C-05    Improve Security Systems  
MOCA-C-14    Write Collection Management Plan  
MOCA-C-18    Establish Exhibit Maintenance

9. Funding Allocations: Funding is needed to support a full time position for natural and cultural resources management, with museum object conservation duties being among the array of responsibilities for this position. This need is described in MOCA-I-03, requesting funds to support this position. Listed below is the current level of expenditures out of the park base for this activity.

|                      | <u>FY 90</u> | <u>FY 91</u> | <u>FY 92</u> | <u>FY 93</u> | <u>FY 94</u> |
|----------------------|--------------|--------------|--------------|--------------|--------------|
| Personal Services    | \$3,000      | \$3,000      | \$3,000      | \$3,000      | \$3,000      |
| Travel and Per Diem  | 0            | 0            | 0            | 0            | 0            |
| Supplies & Materials | <u>300</u>   | <u>300</u>   | <u>300</u>   | <u>300</u>   | <u>300</u>   |
| Total                | \$3,300      | \$3,300      | \$3,300      | \$3,300      | \$3,300      |

10. Annual Project Status and Accomplishments: This report will be initiated once final determination is made by WASO on the proper Servicewide format.

## PROJECT STATEMENT

1. Project Number: MOCA-C-02

2. Project Title: Manage Park Museum Collection

3. Servicewide Issue:

C16 - Inadequate Storage and Environmental Controls for Museum Objects

4. Problem Statement: Montezuma Castle has a museum collection on-site of approximately 140 items; the remainder of the collection is located at the Museum Collections Repository, Western Archeological and Conservation Center (MCR - WACC). Several objects are on display at the Mission 66 Visitor Center Museum. Primarily archeological, there are a number of ethnographic objects - pottery, basketry, and jewelry - on display. The park is also responsible for the exhibits in the Yavapai-Apache Visitor Center, a tribal building in which the park leases space. There are approximately 50 items, historic, archeologic, and ethnographic, on permanent exhibit. These items are on loan from various agencies.

To maintain these objects, there are a number of actions that need to be accomplished on an annual or more frequent basis: Collection Management Report (form 10-94), Annual Inventory for Museum Property, IPM monitoring, curatorial housekeeping, curatorial recordkeeping (accession and catalog records), Scope of Collection Statement review, and environmental recording of all spaces with museum objects.

The park has identified a museum collection manager for the museum; however, the permanent GS-5 Interpreter position located at the Yavapai-Apache Visitor Center, who would be responsible for the exhibits, has not been filled in two years. Currently the Chief, Visitor Services and Resource Management (MOCA/TUZI) has undertaken these duties as time permits.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. This would result in non-compliance with NPS-28, *Manual for Museums*, *Museum Handbook: Part II*, and Special Directive 80-1 (revised).

b. Management of Park Collection Through Contract With a Non-NPS Curator. This action would not be cost-effective. A non-NPS curator may not have the background in NPS standards and regulations. This person could change on a yearly basis leading to a lack of continuity and recordkeeping.

c. Management of Park Collection Through Use of MCR - WACC Curator. This action would not be cost- or time-effective. The MCR - WACC curator would only be able to come to the park on a specifically schedule basis. Any emergency or other unscheduled (accessions) actions would require special trips and additional funding. MCR - WACC might not always send the same staff member leading to a lack of continuity.

d. Management of Collection Through Park Staff Member Specifically Assigned Collections Management Duties. This action would ensure an on-site, trained person who would be available as-needed to perform any collections management duties. This alternative would also ensure continuity of work and records.

6. Description of the Recommended Project or Activity: Option d. is the recommended solution for this issue. A park staff member, identified as a museum collections manager, would have these duties identified in his/her position description and performance standards (critical elements). Yavapai-Apache Visitor Center permanent interpreter position should be filled with these duties clearly spelled out in position description and performance standards. Proper training in curatorial methods must be provided for any staff member working with the collection. This training should come from regional or MCR - WACC professionals.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of the Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to at least four other projects listed in this plan. These are as follows:

MOCA-C-01 Conserve Museum Objects  
MOCA-C-05 Improve Security Systems  
MOCA-C-14 Write Collection Management Plan  
MOCA-C-18 Establish Exhibit Maintenance

9. Funding Allocations: Funding is needed to support a full time position for natural and cultural resources management, with museum collection management responsibilities being among the array of duties for this position. This need is described in MOCA-I-03, requesting funds to support this position. Listed below is the current level of expenditures out of the park base for this activity.

|                      | <u>FY 90</u> | <u>FY 91</u> | <u>FY 92</u> | <u>FY 93</u> | <u>FY 94</u> |
|----------------------|--------------|--------------|--------------|--------------|--------------|
| Personal Services    | \$3,400      | \$3,400      | \$3,400      | \$3,400      | \$3,400      |
| Travel and Per Diem  | 0            | 0            | 0            | 0            | 0            |
| Supplies & Materials | <u>200</u>   | <u>200</u>   | <u>200</u>   | <u>200</u>   | <u>200</u>   |
| Total                | \$3,600      | \$3,600      | \$3,600      | \$3,600      | \$3,600      |

10. Annual Project Status and Accomplishments: This report will be initiated once final determination is made by WASO on the proper Servicewide format.

## PROJECT STATEMENT

1. Project Number: MOCA-C-03

2. Project Title: Update and Maintain Automated National Catalog System Program

3. Servicewide Issue:

C03 - Incomplete Cataloging of Museum Collections (ANCS)

4. Problem Statement: In fall 1987, the Automated National Catalog System (ANCS) was issued to the field from the Curatorial Service Division, WASO. At MCR - WACC, during the inventory project, all previously cataloged items were entered into an ANCS test version. The items remaining at the monument, about 140 in number, have not yet been entered into any data base. Once the MCR - WACC data bases are transferred to the current ANCS program, the park will receive the data for installation in their data base. As the backlog is cataloged, it will be entered directly into the current data base. As this is completed and reviewed, copies of the data base will be provided to the park. This leaves the items located at the park as well as any future acquisitions to be added to the data base so that all the park museum collection will be on the computer and allow park staff and management to manipulate the data and provide reports on a variety of subjects.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. An incomplete data base will not allow full use of the ANCS program for completion of reports such as the Collection Management Report (form 10-94).

b. Monument Staff Catalog Items. Park staff will input the data for the 140 items located in the park. The ANCS program can be used with minimal training and the input of 140 records can be accomplished in a relatively short period of time.

6. Description of the Recommended Project or Activity: Option b. is the recommended solution for this issue. The park museum collections manager should be responsible for the input of these records. The purchase of a computer would be necessary due to the fact that all park computers are located at the Yavapai-Apache Visitor Center and are heavily overused. The ANCS program requires a great deal of space for the data base as well as space for any indexes that are required to access data.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 will likewise not be required for this project.

8. Relationships: This project is related to at least two other projects listed in this plan. These are as follows:

MOCA-C-02 Manage Park Museum Collection  
MOCA-C-14 Write Collection Management Plan

9. Funding Allocations: Funding is needed to support a full time position for natural and cultural resources management, with ANCS responsibilities being among the array of duties for this position. This need is described in MOCA-I-03, requesting funds to support this position. Listed below is the current level of expenditures out of the park base for this activity.

|                      | <u>FY 90</u> | <u>FY 91</u> | <u>FY 92</u> | <u>FY 93</u> | <u>FY 94</u> |
|----------------------|--------------|--------------|--------------|--------------|--------------|
| Personal Services    | \$1,400      | \$1,400      | \$1,400      | \$1,400      | \$1,400      |
| Travel and Per Diem  | 0            | 0            | 0            | 0            | 0            |
| Supplies & Materials | 0            | 0            | 0            | 0            | 0            |
| Total                | \$1,400      | \$1,400      | \$1,400      | \$1,400      | \$1,400      |

10. Annual Project Status and Accomplishments: This report will be initiated once final determination is made by WASO on the proper Servicewide format.

Cultural Resources Project Statements: Unfunded Program

The following project statements are a description of the unfunded cultural resource protection and information program at Montezuma Castle National Monument.

## PROJECT STATEMENT

1. Project Number: MOCA-C-04

2. Project Title: Stabilize Pithouse Floor

3. Servicewide Issue:

C12 - Inadequate Preservation Maintenance Programs, Including Stabilization and Cyclic Maintenance

4. Problem Statement: The pithouse exhibit is an exposed archeological excavation which has been covered with a protective roof structure. The surface of the excavation, which was coated with a thin layer of polymer amended mud shortly after the digging was completed, has held up remarkably well for over 30 years. In recent years however, the surface has begun to crack and come loose in a few areas, exposing the fragile earth beneath. Erosion is beginning to damage exposed areas, seriously endangering this important resource. The surface has been patched in places, but these patches have not blended well with the treated mud and have developed shrinkage cracks around the edges.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. Such management of this cultural resource would fail to meet the NPS Organic Act of 1916 and NPS-28 *Cultural Resources Management Guidelines*. The treated surface will continue to flake-off exposing fragile earth features to erosion.

b. Remove the Amended Mud Surface Only. Such management of this cultural resources would fail to meet the NPS Organic Act of 1916 and NPS-28 *Cultural Resources Management Guidelines*. The exposed fragile earth features will erode and the resource will be lost.

c. Remove and Replace the Amended Mud Surface. The requirements of the NPS Organic Act of 1916 and NPS-28 will be met. The fragile earth features will be protected from further erosion.

6. Description of the Recommended Project or Activity: Option c. is the recommended solution for this issue. A team of three (3) trained ruin stabilization experts should remove the existing amended mud surface and reinstall a new protective layer of amended mud over the earth features in the pithouse floor.

The existing surface should be carefully removed using small hand tools, exercising care to prevent damage to the pithouse features. The exposed features should be carefully examined for deterioration and evaluated for future research potential.

The ruins stabilization team should install this new amended mud surface using small hand tools and their hands to pat the material into place. The new protective surface should be formed using Duraweld-C polymer and local soils in order to better match the color of the surroundings. The new surface should be protected until curing is complete. The pithouse should be recorded with photographs before, during and after the work. The new surface should protect the fragile earth features from erosion due to rain, melting snow, and the abrasive action of footsteps.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA will require Section 106 Compliance under the Preservation Maintenance PMOA using the XXX Form.

8. Relationships: This project is related to at least two other projects listed in this plan. These are as follows:

MOCA-C-16 Prepare Historic Structures Preservation Guide:  
Prehistoric Structures  
MOCA-C-17 Maintain Stabilized Prehistoric Ruins

9. Funding Requirements:

|                      | <u>Year 1</u> |
|----------------------|---------------|
| Personal Services    | \$12,000      |
| Travel and Per diem  | 0             |
| Supplies & Materials | <u>3,000</u>  |
| Total                | \$15,000      |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-C-05

2. Project Title: Improve Security Systems

3. Servicewide Issue:

C20 - Inadequate Security

4. Problem Statement: The museum exhibit spaces at Montezuma Castle are in a Mission 66 building; the exhibits are of the same era. There are a number of exhibits that, while secured with tamper-proof screws, are not visible from the information desk where the park staff is normally located. In addition, the number of visitors in the space often is so large that the staff is very busy just answering questions, making it impossible to keep a close eye on the display cases. Only about 50% of the display cases are constructed with tamper proof screws.

These cases exhibit a number of monetarily and intrinsically valuable ethnographic and archeologic objects that are extremely collectible. The artifacts are very vulnerable to theft or damage under current conditions.

The present electronic security system is on only during hours that the museum is closed and it rings in the homes of park staff. Police are then summoned as necessary.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. The exhibited artifacts would remain vulnerable to theft or damage. The park would not be in compliance with Special Directive 80-1 (revised).

b. Replace All Cabinet Screws With Tamper-proof Screws. This would offer increased protection compared to current conditions but would still allow theft or damage during time when the museum is particularly crowded.

c. Install 24-hour Electronic Systems on All Exhibit Cases and Install Tamper-proof Screws. This would offer the most protection for the artifacts.

6. Description of the Recommended Project or Activity: Option c. is the recommended solution for this issue. The security system should be designed to fully integrate a 24-hour system for the exhibit cases and an intrusion detection system for hours when the museum is not open. A fire detection system that includes local alarms should also be included in the design. The security system should be integrated with the local police and fire departments or a security company.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to at least two other projects listed in this plan. These are as follows:

MOCA-C-02 Manage Park Museum Collection  
MOCA-C-13 Archeological Overview and Assessment

9. Funding Requirements:

|                      | <u>Year 1</u> |
|----------------------|---------------|
| Personal Services    | \$ 5,000      |
| Travel and Per Diem  | 0             |
| Supplies & Materials | 0             |
| Capital Equipment    | <u>10,000</u> |
| Total                | \$15,000      |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-C-06

2. Project Title: Rebuild Montezuma Castle Museum

3. Servicewide Issue:

C16 - Inadequate Storage and Environmental Controls for Museum Objects

4. Problem Statement: The Montezuma Castle museum is located in a visitor center constructed in 1960, a small and fairly typical Mission 66 structure. During the summer months the doors of the building stand open to allow the evaporative cooler to work properly. The visitation at the site is currently in excess of 650,000 per year. All of these factors lead to an unsatisfactory environment for the preservation of museum objects. The recording hygrothermograph located in the museum has recorded excessive changes in temperature and especially relative humidity in a 24-hour period.

The standards for museum environment are fairly rigid and must be maintained for the preservation of the collection. The environment of the museum at the present time is placing a great deal of stress on the artifacts. High relative humidity coupled with rapid changes in both relative humidity and temperature are stressful to objects, particularly organic material. In addition, such an environment is conducive to the presence of museum pests. The items on display in the museum are made up of a variety of materials with a great number of the artifacts particularly vulnerable to the changes in environment.

There is not adequate space to deal with visitors, cooperating association outlet, as well as the museum. In addition, the current design of the visitor information desk does not allow adequate viewing of the museum exhibit space by the staff to provide security for them.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. This would lead to non-compliance with NPS standards including Special Directive 80-1 (revised). The museum objects would deteriorate due to undue stress and pest infestation.

b. Revamp the Current Environmental Control System and Redesign the Information Desk. This would provide an environment better able to preserve the collection. It would also increase the security to the exhibit area by providing oversight of all areas in the museum.

c. Expand the Visitor Center. This alternative would provide more visitor contact space, an improved natural history association sales outlet area, provide a climate control system that regulates temperature and relative humidity, and expand the information desk. Better security would also be provided for the exhibit area and visitor use areas would be better used. There would be more control over visitor access to the site.

6. Description of the Recommended Project or Activity: Option c. is the recommended solution for this issue. Rebuild the visitor center to include an expanded visitor contact area, sales outlet, and museum exhibits. This would include the redesign of the information desk to provide greater security to the exhibits. The museum environment would be maintained by the installation of a climate control system that would regulate both temperature and relative humidity.

7. Compliance: An environmental assessment would be required for any construction that would expand the built environment in the monument. Likewise, NHPA compliance would be required for this project. Such compliance would be done on a project-specific basis prior to construction.

8. Relationships: This project is related to at least three other projects listed in this plan. These are as follows:

MOCA-C-02 Manage Park Museum Collection  
MOCA-C-05 Improve Security Systems  
MOCA-C-18 Establish Exhibit Maintenance

9. Funding Requirements:

|                         | <u>Year 1</u> | <u>Year 2</u>  |
|-------------------------|---------------|----------------|
| Planning & Design Costs | \$ 50,000     | \$ 0           |
| Construction Costs      | <u>0</u>      | <u>300,000</u> |
| Total                   | \$ 50,000     | \$300,000      |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-C-07

2. Project Title: Update Administrative History

3. Servicewide Issue:

C08 - Need for Historic Resource Studies and Administrative Histories

4. Problem Statement: Montezuma Castle has a 1965 Administrative History that needs to be updated. Montezuma Well needs a historic resource study to deal with the Smokehouse, a potentially historically significant log building about which there is conflicting and insufficient data. If significant, it will need a National Register form. An existing draft National Register form on two Montezuma Castle Monument staff residences needs to be completed. Updating the Administrative History to include actions since 1965, combined with adding two chapters that meet standards for a historic resource study at Montezuma Well, will give Montezuma Castle a useful document.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. Update Administrative History. Fund and accomplish this update of the administrative history, which will help the superintendent, particularly when new to Montezuma Castle, to understand the public and private interactions that have occurred since the earliest days of the monument. Many of these interactions have helped shape the way things are done and the reasons behind certain decisions and practices. This is valuable information for the superintendent to have. Such an update will also accomplish one aspect of NHPA compliance.

b. No Action. Park will not be in compliance with NHPA until this project is accomplished, and will not be in compliance with WASO directives on having a current administrative history for each park unit in the system.

6. Description of the Recommended Project or Activity: Option a. is the recommended solution to this issue. Revise the existing administrative history as needed, including an update from 1965 to 1988, as well as a historic resource study of the Montezuma Well Smokehouse and Montezuma Castle National Monument staff residences, accompanied by requisite National Register forms and historic base maps.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project. Accomplishing this project will actually assist future NHPA compliance activities in the monument.

8. Relationships:

MOCA-C-10      Update the Cultural Resources Bibliography

9. Funding Requirements:

Year 1

|                   |          |
|-------------------|----------|
| Research Contract | \$25,000 |
| Total             | \$25,000 |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-C-08
2. Project Title: Study of Montezuma Castle Irrigation System
3. Servicewide Issue:  
C02 - Inadequate Archeological Survey & Inventory, Including Archeological Identification and Evaluation Studies, Overviews, and Assessments
4. Problem Statement: It is assumed that the prehistoric sites near Montezuma Well were small farming settlements that relied on irrigation ditches coming from the well. However, the ditch system has not been systematically studied to determine its age, extent, flow capacity, or the results of mineral deposits in the canal.
5. Alternative Actions/Solutions and Their Probable Impacts:
  - a. No Action. The interpretive story at the Well will rely on traditional lore and analogy with modern irrigation systems.
  - b. Review Documentation of Prehistoric Systems in the Southwest. This will add some background for interpretation but will not increase knowledge of the system at Montezuma Well.
  - c. Study Irrigation System. This option would conduct a thorough study of the Montezuma Castle irrigation ditch system to gather as much information as possible on flow rates, length of use, aerial extent of the system, etc.
6. Description of the Recommended Project or Activity: Option c. is the recommended solution to this issue. Past records of canal systems will be gathered, existing aerial photographs will be examined and new low-altitude low angle aerial photographs will be taken. Visible canal systems will be mapped. Exposed canals will be examined, and additional segments will be exposed and sectioned to examine mineral deposits and estimate flow rates. Feasibility of dating canals will be assessed. Canal system's age, extent and capacity will be compared to other prehistoric canal systems. Potential for further research will be assessed, and proposals for further work will be prepared.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance through Section 106 will require regional and SHPO review and approval.

8. Relationships: This project has no relationship to any other project in this plan. Findings, however, will be incorporated into the monuments's interpretive program and prospectus.

9. Funding Requirements:

|                        | <u>Year 1</u> |
|------------------------|---------------|
| Personal Services      | \$10,000      |
| Travel and Per Diem    | 2,000         |
| Aerial Photography     | 1,000         |
| Supplies and Materials | 600           |
| Publication Costs      | 800           |
| Total                  | \$14,400      |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-C-09

2. Project Title: Survey and Inventory Collections for Montezuma Castle Objects

3. Servicewide Issue:

C10 - Need for Specialized Studies for Unique or Complex Management Issues

4. Problem Statement: Montezuma Castle and Montezuma Well had become quite well known by the people of the Verde Valley and the Prescott, Arizona, areas by the 1880's. However, there was no attempt to provide a written record of the area or do a study of the features involved. Dr. Edgar A. Mearns, an Army surgeon stationed at Fort Verde from 1884 to 1888, was apparently the first Anglo to do any serious study of the ruins. Mearns had a keen scientific mind and, although he was not an archeologist, his broad interest in the prehistory of humans in the Valley as well as the natural history of the area enabled him to delve further into the area than anyone had done previously. The Castle was described in detail by Mearns in an 1890 article in *Popular Science* ("Ancient Dwellings of the Rio Verde," May 1890, p 747). Apparently Mearns collected artifacts in the ruins and, according to communication between the park Custodian Homer F. Hastings and Mrs. H. W. Schroeder, some objects were placed in the collection of the American Museum of Natural History in New York. It may be that all human remains were taken to the Army Medical Museum. In further correspondence with the Field Museum of Natural History of Chicago, Albert H. Schroeder was unable to determine the location of objects referred to by a Dr. Cole in notes at the park.

A Dr. Miller of the Arizona Antiquarian Society supervised basic stabilization and repairs to the Castle about 1898. Dr. Harold S. Colton, later founder and director of the Museum of Northern Arizona, was also interested in the area. In the early years of the twentieth century there were several men who made careful studies of the Castle. The early NPS restoration work and excavation yielded collections that are included in the park collection and stored at MCR - WACC.

Because of the general interest in southwestern archeology and the fact that these ruins were well-known long before establishment as a monument (1906), it is quite likely that there exist archeological collections from Montezuma Castle, Montezuma

Well, and other sites within the Monument in institutions outside the National Park Service. Except for a few items located at the American Museum of Natural History, there is no information of the location of any artifacts from the prehistoric sites with the monument.

In order to fully study and understand the people who built and lived in Montezuma Castle and the other ruins within the monument, all artifacts and collections from these sites need to be studied and compared. Those items collected within the monument following its establishment need to be cataloged into the NPS system and possibly returned.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. This alternative would lead to continued lack of understanding of the sites within Montezuma Castle National Monument. Any items that have been obtained following the establishment of the monument could possibly lack compliance with NPS standards regarding the cataloging and preservation of NPS museum collections.

b. Have Volunteers Track Objects. Enlist a volunteer, perhaps a graduate student of archeology and museum management, to undertake a survey of the most pertinent institutions and longtime local families to determine where artifacts and information related to the ruins and excavations might be located. This would require an individual with diplomatic skills in order to deal with people who may be hostile to the federal government.

c. Hire a Professional Archeologist or Curator for Inventory. Hire an archeologist, or a curator with archeological experience, to conduct a survey of the most pertinent institutions and longtime local families to determine where artifacts and information related to the ruins and excavations might be located.

6. Description of the Recommended Project or Activity: Option c. is the recommended solution to this issue. A survey of appropriate institutions should be undertaken to determine where collections from the monument lands are located. These should include those items collected prior to establishment as well as any that have been removed since. Initial work should begin with a letter to all institutions who were active in southwestern archeology prior to 1934. There should be no request for return of any material during this mail inquiry. Following initial contact, those institutions which have or may have material should be contacted and the items should be inspected.

At the same time, longtime local families should be contacted in a non-threatening manner to learn as much about the early explorations and information as possible; this might include family photographs, letters, etc. Every effort should be made to learn if anyone has any artifacts from the ruins. However, every effort should also be made to ensure that there is no feelings of threat from these contacts. The goal should be the gathering of information only.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is not related to any other projects listed in this plan.

9. Funding Requirements:

|                     | <u>Year 1</u> | <u>Year 2</u> |
|---------------------|---------------|---------------|
| Personal Services   | \$28,000      | \$13,200      |
| Travel and Per Diem | 8,000         | 4,000         |
| Publication Costs   | 0             | 800           |
| Total               | \$36,000      | \$18,000      |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-C-10

2. Project Title: Update/Correct the Cultural Resources Bibliography

3. Servicewide Issue:

C26 - Other (Lack of CRBIB)

4. Problem Statement: The Cultural Resources Bibliography (CRBIB) lists five entries for Montezuma Castle and Montezuma Well. A quick search of the monument library identified at least 24 additional items not in the CRBIB, and there may be more. Searches of Regional Library and WACC Library also are needed.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. Fund the Completion of CRBIB. This option would provide for the development of an updated bibliographic data base that will be helpful to park interpreters, researchers, and managers for years to come.

b. No Action. The impact of this option would be that CRBIB will remain incomplete, potential to duplicate research already done.

6. Description of the Recommended Project or Activity: Option a. is the recommended solution to this issue. Project is to update the five existing entries and prepare new CRBIB bibliography entries for Montezuma Castle and Montezuma Well, encompassing all relevant books, reports, articles, monographs and manuscripts on the subject found in the Monument, Regional Office, and Western Archeological and Conservation Center Libraries.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to two other projects in this plan, namely:

MOCA-C-07 Update Administrative History

MOCA-C-20 Obtain Historic Photographs of Montezuma Castle

9. Funding Requirements:

|                      | <u>Year 1</u> |
|----------------------|---------------|
| Personal Services    | \$1,000       |
| Travel and Per Diem  | 750           |
| Supplies & Materials | 0             |
| Library Services     | <u>250</u>    |
| Total                | \$2,000       |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-C-11
2. Project Title: Complete Cultural Sites Inventory
3. Servicewide Issue:  
C02 - Inadequate Archeological Survey & Inventory, Including Archeological Identification and Evaluation Studies, Overviews, and Assessments
4. Problem Statement: The Cultural Sites Inventory (CSI) for Montezuma Castle has been completed through a total archeological inventory, with the exception of: 1) coverage of 2+ acres on the northeast boundary; 2) a plan map of Castle A; and 3) record and description of caveate structures below Montezuma Castle. These are necessary to complete its cultural site inventory, which has been conducted first in the 1950's by A. Schroeder and updated in 1988 by S. Wells.
5. Alternative Actions/Solutions and Their Probable Impacts:
  - a. Use Existing Records to Complete the CSI. This leaves incomplete inventory and incomplete data for the National Register documentation for this nationally significant resource.
  - b. Conduct Complete Inventory. Fund and conduct the needed survey and mapping of the structures to a level of documentation needed for National Register assessment of these structures to complete the CSI.
6. Description of the Recommended Project or Activity: Option b. is the recommended solution to this issue. Survey, map and record these remaining areas at USDI and professional standard. Produce a publishable report.
7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to one other project in this plan, namely:

MOCA-C-08 Prepare Historic Structures Preservation Guide:  
Prehistoric Structures

9. Funding Requirements:

|                      | <u>Year 1</u> |
|----------------------|---------------|
| Personal Services    | \$ 8,500      |
| Travel and Per Diem  | 500           |
| Supplies & Materials | 500           |
| Publication Costs    | <u>500</u>    |
| Total                | \$10,000      |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-C-12

2. Project Title: Date Montezuma Castle

3. Servicewide Issue:

CO2 - Inadequate Archeological Evaluation Study

4. Problem Statement: Since Montezuma Castle was almost entirely cleared of artifacts by the late 1800's and none of the structural wood is datable by the tree-ring method, there are no direct dates for the ruin. It is assumed that the cliff dwelling dates from the Tuzigoot Phase (A.D. 1200-1400) by analogy to pueblos of that period, and this is the basis for its interpretation. However, the actual age of the Castle is not known.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. Continue to ascribe Montezuma Castle's age to the 14th and 15th centuries by analogy to other Tuzigoot Phase pueblos. This is based on assumptions that cannot be substantiated, and is a deficiency in area interpretation.

b. Excavate Montezuma Castle. Fund and conduct an archeological excavation within the rooms of the Castle. There are a few rooms with original deposits beneath the floors, and excavation in these deposits might recover a sample of decorated pottery which could give the age of the Castle to the closest 50 or 100 years. However, the logistics of this excavation, and the potential for structural disturbance make this an impractical approach, with no guarantee of obtaining the information desired.

c. Run a series of small-sample C14 accelerator dates. It is now possible to run C14 dates on very small samples; thus a series of dates could be run from the outer surfaces (exterior rings at cutting time) of a sample of wooden beams from the Castle. By taking samples from different rooms and levels of the Castle it should be possible to obtain a suite of dates centering on the age of occupation of the Castle, with a margin of error of less than a century. It may also be possible to obtain relative dates for a building sequence which can be used to validate or invalidate the building sequence recently derived from wall superposition and corner joints.

6. Description of the Recommended Project or Activity: Option c. is the recommended solution for this issue. This option will require that researchers obtain wood from 2 or 3 locations in levels 1-4 (level 5 has no wood) of the Castle, and submit duplicate samples to two different laboratories to control for errors. A final report will be produced that meets professional and Department of Interior standards.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 6 will require XXX and SHPO review and concurrence before project is initiated.

8. Relationships: This project is related to at least one other project listed in this plan. This is as follows:

MOCA-C-13 Archeological Overview and Assessment

9. Funding Requirements:

|                     | <u>Year 1</u> |
|---------------------|---------------|
| Personal Services   | \$ 1,000      |
| Travel and Per Diem | 200           |
| Contract Analysis   | 10,000        |
| Publication Costs   | <u>500</u>    |
|                     | \$11,700      |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on this project.

## PROJECT STATEMENT

1. Project Number: MOCA-C-13

2. Project Title: Archeological Overview and Assessment

3. Servicewide Issue:

C02 - Inadequate Archeological Survey & Inventory, Including Archeological Identification and Evaluation Studies, Overviews, and Assessments

4. Problem Statement: A general archeological overview of the Verde Valley was done under general contract by Paul and Suzanne Fish in 1977. This provided a general context for Tuzigoot and Montezuma Castle, but did not address prehistoric settlement or landscape of which Montezuma Castle and nearby sites were a part. Presently the U.S. Forest Service is preparing an archeological overview of the Verde Valley which may address these concerns. However, further study should be done to produce a report on settlement and the probable prehistoric landscape of Montezuma Castle and Well.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. There will be no professional basis for interpreting Montezuma Castle's cultural and natural surroundings, except limited data from existing sources. There will be no basis for appropriate systematic management of natural vegetation.

b. Conduct Archeological Overview and Assessment. Fund and conduct an archeological overview and assessment using previous data and reports from the Beaver Creek study and other climate and archeobotanical data for the park. This study will provide valuable scientific and interpretive data on the settlement of and probable prehistoric landscape at Montezuma Castle and Montezuma Well.

6. Description of the Recommended Project or Activity: Option b. is the recommended solution to this issue. Conduct a review of archeological data and reports for Beaver Creek to reconstruct the prehistoric Tuzigoot Phase settlement system and landscape. Relate Montezuma Castle to contemporary sites that formed a system of land use in this drainage. Review existing archeobotanical and climatic data to reconstruct probable patterns of vegetation and land use.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to one other project in this plan, namely:

MOCA-C-11 Completion of Cultural Sites Inventory (CSI)

Information will be used in area interpretation and in Natural Resource Management activities.

9. Funding Requirements:

|                      | <u>Year 1</u> |
|----------------------|---------------|
| Personal Services    | \$5,000       |
| Travel and Per Diem  | 750           |
| Supplies & Materials | 0             |
| Publication Costs    | <u>250</u>    |
| Total                | \$6,000       |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-C-14

2. Project Title: Write Collection Management Plan

3. Servicewide Issue:

C09 - Need for Collection Management Plans, Collection Storage Plans, Collection Condition Surveys

4. Problem Statement: Management of the collection of archeological, ethnological, and historical material is an on-going concern. The museum collection currently located at the monument numbers approximately 140 items; the remaining items are located at MCR - WACC. The park staff is responsible for the preservation of the collection in perpetuity. To assist in this work, a Collection Management Plan, required by NPS-28, needs to be written. This document would include a brief history of the collection and an overview of the present collection; a current Scope of Collections Statement with recommended changes to the statement; current status and recommendations regarding museum records; current status (environment and maintenance) of museum exhibits with recommendations for improvement; current status with recommendations for museum security and fire detection/protection; current status with recommendations for museum staffing; and future planning/sources of funding. With this plan, the park will be in compliance with the standards.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. The park would not be in compliance with NPS-28. The staff has managed the collection in accordance with NPS standards to the best of their ability. This has been accomplished by sending much of the collection to MCR - WACC and by properly cataloging and curating the items on display in the museum.

b. Collection Management Plan Written by Park Staff. An outside team of curatorial experts is recommended for writing such plans. This allows for fresh eyes to view the park, collection, and its problems and make recommendations.

c. Collection Management Plan Written by a Curatorial Team. This team would be from the Curatorial Services Division, WASO, who are mainly responsible for the production of such plans. This alternative is not cost-effective do to the fact that the

size of the collection and the amount of activity related to them do not, at this time, require the full-scale plan as outlined in NPS-28.

d. Collection Management Plan Written by a Curator from a Park, MCR - WACC, or the Regional Office. This alternative is the most cost-effective, and still provides the outside expertise the monument can benefit from.

6. Description of the Recommended Project or Activity: Option d. is the recommended solution for this issue. A Collection Management Plan written by a curator from a park, MCR - WACC, or the regional office is recommended. This plan will be in the form of an expanded trip report and will include the sections listed above. Since the park has no collections in storage, it will not need to have a storage section but will include an overview of the collections stored at MCR - WACC and any other repositories, if appropriate.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to one other project in this plan, namely:

MOCA-C-09 Survey and Inventory Collections for Montezuma Castle Objects

9. Funding Requirements:

|                      | <u>Year 1</u> |
|----------------------|---------------|
| Personal Services    | \$1,250       |
| Travel and Per Diem  | 500           |
| Supplies & Materials | 0             |
| Publication Costs    | <u>250</u>    |
| Total                | \$2,000       |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-C-15
2. Project Title: Prepare Historic Structure Preservation Guide: Historic Structures
3. Servicewide Issue:

C06 - Need for Historic Structure Preservation Guides

4. Problem Statement: There is a great need to provide direction for the preservation maintenance activities on these structures. The structures are now in a maintainable condition. However, it is imperative to provide maintenance personnel with a reference for programming, continued housekeeping, routine, and cyclic preservation maintenance. The HSPG will provide, as well, the necessary information for orderly, timely, and proper inspection and maintenance.

Specific key points that must be monitored in an annual inspection will be; impacting vegetation around the building base, water drainage, and adobe wall construction. These are not the only points to be monitored, however, they are the elements that present the greatest areas of deterioration.

The impact on these structures is from normal daily use by park personnel. The level of impact is low for its effects are not a direct threat to visitor or staff safety. However, directing the maintenance activities on these structures is considered to be of the utmost importance to insure that the present maintainable condition of the structures is retained without loss of historic fabric or details.

The resources to be included in this HSPG are as follows:

Structure No. 04 - Residence  
Structure No. 05 - Residence

5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. Management of the Cultural Resources fails to meet the Act of 1916 and NPS-28 Cultural Resources Management Guidelines. The level of impact on the structures increases from low to moderate within two years.

b. Establish an HSPG for Structures. The requirements of the Act of 1916 and NPS-28 will be met. Maintenance/ Preservation activities on the structures will follow a prescribed schedule and be accomplished along parameters that will insure the impact will remain low.

6. Description of the Recommended Project or Activity: Option b. is the recommended solution for this issue. A task directive, outlining the requirements and goals of the project, will be prepared by the Western Region Division of Park Historic Preservation.

The HSPG will be a working document, produced in loose-leaf format with the pages dated to facilitate updating without reprinting the entire document. The completed document will contain three major sections: instructions, schedules, and reference materials.

Personnel required for the compilation of the HSPG will be park maintenance personnel, a historical architect, and a historian. The following procedures for developing an HSPG will be used:

- 1) A historical architect, and a historian will assemble basic inspection and preservation instructions, as well as specifications, and prepare or modify as-built drawings and other initial pertinent reference material.
- 2) Copies of an initial draft of the above documents will be forwarded to the monument, Southern Arizona Group offices, and region for review and shortly thereafter the specialists and area and regional office staff will meet at the site to suggest additions, changes, or deletions.
- 3) Based on the initial draft, the monument and SOAR staff will draft a cyclic preservation maintenance schedule to be reviewed by the specialists during the above site visit.
- 4) Based on the revised draft of the guide resulting from the above meeting, the document will be completed and submitted for area concurrence and regional approval.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 will be required for this project.

8. Relationships: This project is not related to any other projects listed in this plan.

9. Funding Requirements:

Year 1

|              |                 |
|--------------|-----------------|
| DSC Contract | <u>\$30,000</u> |
| Total        | \$30,000        |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-C-16
2. Project Title: Prepare Historic Structure Preservation Guide: Prehistoric Structures
3. Servicewide Issue:

C06 - Need for Historic Structure Preservation Guides

4. Problem Statement: Until late in 1987 the prehistoric structures of Montezuma Castle were maintained by a Ruins Stabilization Specialist operating out of the Western Archeology and Conservation Center. The Specialist provided preservation and stabilization of prehistoric ruins throughout National Parks in both the Western and Southwest Regions. His knowledge of preservation and stabilization, gathered through years of experience, served as the Preservation Guide for work on these structures. In 1987 the Ruins Stabilization Specialist retired, taking with him the entire history and technology of ruins preservation that he had developed over the years.

There is a great need to provide direction for the preservation maintenance activities on the prehistoric structures of the monument. The structures are now in a maintainable condition. However, it is imperative to provide maintenance personnel and stabilization teams with a reference for programming, continued housekeeping, routine, and cyclic preservation maintenance. The HSPG will provide, as well, the necessary information for orderly, timely, and proper inspection and maintenance.

The impact on these structures is from visitation and erosion. The level of impact is low for its effects are not a direct threat to visitor or staff safety. However, directing the maintenance activities on these structures is considered to be of the utmost importance to insure that the present maintainable condition of the structures is retained without loss of historic fabric or details. These prehistoric resources are of National Significance and are the prime resource for which the Monument was established.

The resources to be included in this HSPG are as follows:

Structure No. NA 1272  
Structure No. NA 1271  
Structure No. NA 1273  
Structure No. NA 1273A

Structure No. NA 1278 (Castle B)  
Structure No. NA 4616  
Structure No. NA 4630  
Structure No. NA 5553  
Structure No. NA 6373 (Castle A)

5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. Management of the Cultural Resources fails to meet the Act of 1916 and NPS-28 Cultural Resources Management Guidelines. The level of impact on the structures increases from low to moderate within two years.

b. Establish an HSPG for the Structures. The requirements of the Act of 1916 and NPS-28 will be met. Maintenance/preservation activities on the structures will follow a prescribed schedule and be accomplished along parameters that will insure the impact will remain low.

6. Description of the Recommended Project or Activity: Option b. is the recommended solution for this issue. A task directive, outlining the requirements and goals of the project, will be prepared by the Western Region Division of Park Historic Preservation.

The HSPG will be a working document, produced in loose-leaf format with the pages dated to facilitate updating without reprinting the entire document. The completed document will contain three major sections: instructions, schedules, and reference materials.

Personnel required for the compilation of the HSPG will be park maintenance personnel, a ruins stabilization specialist, a historical architect, an anthropologist, and a historian. The following procedures for developing an HSPG will be used:

- 1) A ruins stabilization specialist, a historical architect, and an anthropologist, will assemble basic inspection and preservation instructions, as well as specifications, and prepare or modify as-built drawings and other initial pertinent reference material;
- 2) Copies of an initial draft of the above documents will be forwarded to the Monument, Southern Arizona Group offices, and region for review and shortly thereafter the specialists and area and regional office staff will meet at the site to suggest additions, changes, or deletions.

- 3) Based on the initial draft, the ruins stabilization specialist will draft a cyclic preservation maintenance schedule to be reviewed by the area and region during the above site visit.
- 4) Based on the revised draft of the guide resulting from the above meeting, the document will be completed and submitted for area concurrence and regional approval.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 will be required for this project.

8. Relationships: This project is related to two other projects in this plan, namely:

MOCA-C-11 Completion of Cultural Sites Inventory (CSI)  
MOCA-C-12 Excavate in Montezuma Castle

9. Funding Requirements:

|                      | <u>Year 1</u> |
|----------------------|---------------|
| Personal Services    | \$12,000      |
| Travel and Per Diem  | 600           |
| Supplies & Materials | 0             |
| Publication Costs    | <u>400</u>    |
| Total                | \$13,000      |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-C-17
2. Project Title: Maintain Stabilized Prehistoric Ruins
3. Servicewide Issue:  
C12 - Inadequate Preservation Maintenance Programs, Including Stabilization and Cyclic Maintenance
4. Problem Statement: From 1925 to 1928, Frank Pinkley and Martin Jackson conducted extensive repairs on Montezuma Castle. However, in 1951, the Castle was closed to the public due to structural weaknesses. From 1951 through the 1970-'s stabilization was confined largely to water proofing roofs in the exposed outer tier of rooms, correcting points of internal stress, and resurfacing eroded facings. Routine minor stabilization was done by maintenance staff.

From the late 1970's until now the stabilization of the prehistoric structures was accomplished by a Ruins Stabilization Specialist. The structures are now in a maintainable condition and the impact is low, however to keep these structures in this condition they must be maintained on a cyclic basis.

Structure No. NA 1272  
Structure No. NA 1271  
Structure No. NA 1273  
Structure No. NA 1273A  
Structure No. NA 1278 (Castle B)  
Structure No. NA 4616  
Structure No. NA 4630  
Structure No. NA 5553  
Structure No. NA 6373 (Castle A)

5. Alternative Actions/Solutions and Their Probable Impacts:
  - a. No Action. Management of the cultural resources fails to meet the NPS Organic Act of 1916 and NPS-28, Cultural Resources Management Guidelines. The level of impact on the structures increases from low to moderate within two years.
  - b. Maintain Stabilized Prehistoric Ruins. Maintain the structures, thus meeting the requirements of the NPS Organic Act of 1916 and NPS-28. Impacts to the structures will remain low.

6. Description of the Recommended Project or Activity: Option b. is the recommended solution for this issue. The work is to be accomplished by the monument's maintenance staff. Following instructions in the Historic Structure Preservation Guide, the maintenance staff will continue to maintain the structures.

The Ruins Stabilization Specialist will provide assistance for training and difficult maintenance tasks. The specialist will provide closeout of all work undertaken.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 will be required for this project.

8. Relationships: This project is related to one other project in this plan, namely:

MOCA-C-16 Prepare Historic Structure Preservation Guide,  
Prehistoric Structures.

9. Funding Requirements: This demanding project requires a park base increase to meet the needs of the cultural resources protection program of the monument.

|                      | <u>Year 1</u> | <u>Year 2</u> | <u>Year 3</u> | <u>Year 4</u> | <u>Year 5</u> |
|----------------------|---------------|---------------|---------------|---------------|---------------|
| Personal Services    | \$12,000      | \$12,000      | \$12,000      | \$12,000      | \$12,000      |
| Travel and Per Diem  | 1,000         | 1,000         | 1,000         | 1,000         | 1,000         |
| Supplies & Materials | <u>3,000</u>  | <u>3,000</u>  | <u>3,000</u>  | <u>3,000</u>  | <u>3,000</u>  |
| Total                | \$16,000      | \$16,000      | \$16,000      | \$16,000      | \$16,000      |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-C-18

2. Project Title: Establish Exhibit Maintenance

3. Servicewide Issue:

C16 - Inadequate Storage and Environmental Controls for Museum Objects

4. Problem Statement: The exhibits at the Montezuma Castle museum were designed and installed as part of the Mission 66 program that built the visitor center. These exhibits are now almost 30 years old. All exhibits need work from time to time to maintain them in good order. This includes installation of new photographs, cleaning of exhibit panels and cases, replacement of worn-out or damaged equipment, and, occasionally, the replacement of labels due to former inaccuracies or results of new research.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. The current fading and damaged photographs and other exhibit media would continue to deteriorate and distract from the exhibits. This would not meet NPS standards for exhibits.

b. Establish Exhibit Maintenance. Establish program of exhibit maintenance that includes replacement of damaged or worn material and cleaning of all exhibits as necessary. This would ensure that the exhibits would meet all NPS standards and would convey correct information to the public.

6. Description of the Recommended Project or Activity: Option b. is the recommended solution for this issue. The establishment of a program for exhibit maintenance to replace or clean any exhibit that is worn or incorrect is recommended. This program would annually inspect all exhibits and maintain a prioritized list of needed work. Work would be accomplished as needed to clean, upgrade, and/or replace any exhibit or part of an exhibit that is need of such due to fading, damage, or inaccurate information.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to two other projects in this plan, namely:

MOCA-C-02 Manage Park Museum Collection  
MOCA-C-14 Write Collection Management Plan

9. Funding Requirements: This demanding project requires a park base increase to meet the needs of the cultural resources protection program of the monument.

|                      | <u>Year 1</u> | <u>Year 2</u> | <u>Year 3</u> | <u>Year 4</u> | <u>Year 5</u> |
|----------------------|---------------|---------------|---------------|---------------|---------------|
| Personal Services    | \$5,000       | \$5,000       | \$5,000       | \$5,000       | \$5,000       |
| Travel and Per Diem  | 0             | 0             | 0             | 0             | 0             |
| Supplies & Materials | <u>1,000</u>  | <u>1,000</u>  | <u>1,000</u>  | <u>1,000</u>  | <u>1,000</u>  |
| Total                | \$6,000       | \$6,000       | \$6,000       | \$6,000       | \$6,000       |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-C-19

2. Project Title: Maintain Historic Structures

3. Servicewide Issue:

C13 - Need for Rehabilitation or Restoration of Historic or Prehistoric Structures and Cultural Landscape

4. Problem Statement: The existing management program for these structures has resulted in buildings that are now maintainable. However, cyclic maintenance must be performed on these structures to keep the impact at a low level from normal daily use by monument personnel.

The cyclic maintenance of these adobe structures requires more attentive and specialized work than does that of the other park structures. Maintenance inspections must be performed to insure that water and other deteriorating elements are discovered before problems develop. After inspection the maintenance must be performed according to an HSPG.

The structures to be included in this work are as follows:

Structure No. 04 - Residence

Structure No. 05 - Residence

5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. Management of the Cultural Resources fails to meet the NPS Organic Act of 1916 and NPS-28, Cultural Resources Management Guidelines. The level of impact on the structures increases from low to moderate within two years.

b. Maintain Historic Structures. Maintain the structures, thus meeting the requirements of the NPS Organic Act of 1916 and NPS-28. Impacts to the structures will remain low.

6. Description of the Recommended Project or Activity: Option b. is the recommended solution for this issue. The work is to be accomplished by the Monument's maintenance staff. Following instructions in an Historic Structures Preservation Guide, the maintenance staff will continue to maintain these buildings.

The Ruins Stabilization Specialist will provide assistance for training and difficult maintenance tasks. The specialist will provide closeout of all work undertaken.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance through Section 106 requires that all undertakings be reviewed by regional professionals under the XXX Form.

8. Relationships: This project is related to one other project in this plan, namely:

MOCA-C-15 Prepare Historic Structure Preservation Guide:  
Historic Structures.

9. Funding Requirements:

|                        |              |
|------------------------|--------------|
| Personal Services      | \$6,000      |
| Travel and Per Diem    | 500          |
| Supplies and Materials | <u>1,500</u> |
| Total                  | \$8,000      |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-C-20

2. Project Title: Obtain Historic Photographs of Montezuma Castle

3. Servicewide Issue:

C10 - Need for Specialized Studies for Unique or Complex Management Issues

4. Problem Statement: No systematic search of libraries, historical societies, museums, university anthropology and archeology departments or other relevant depositories to obtain copies of early historic photos of ruins, especially 19th century photographs, has ever been done. Photographs may show portions of ruins now collapsed, missing or vandalized, and structural details and conditions now lost. For example, pre-1900 locally sponsored stabilization may have closed historic doorways.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. Search for Historic Photographs of Montezuma Castle. Conduct a thorough search of all available sources for historic photographs of Montezuma Castle. This data will provide useful information on structural conditions through time, landscaping and historic scene changes, etc.

b. No Action. Essential historic data will remain unknown and could be lost through careless handling of photographs in private hands.

6. Description of the Recommended Project or Activity: Option a. is the recommended solution for this issue. Search libraries, historical societies, museums, university archeology and anthropology departments and other relevant depositories of historic photos for photographs made before 1941 of prehistoric ruins in the Montezuma Castle and Montezuma Well units of Montezuma Castle National Monument, and acquire large format (4"x5") copy negatives where possible and/or 8x10 prints (preferably on non-resin paper) of any views not already in monument files or other NPS repositories. Supplement with brief memorandum of repositories and collection searched, and any known but not searched. Photographs should be preserved in permanent park collection or in Western Archeological and Conservation Center.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 6 is likewise not required for this project.

8. Relationships: This project is related to one other project in this plan, namely:

MOCA-C-16 Prepare Historic Structure Preservation Guide:  
Prehistoric Structures

9. Funding Requirements:

|                          | <u>Year 1</u> |
|--------------------------|---------------|
| Personal Services        | \$15,000      |
| Travel and Per Diem      | 4,000         |
| Photo Reproduction Costs | <u>2,000</u>  |
| Total                    | \$21,000      |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

Integrated Resources Project Statements: Funded Program

The following project statements are a description of the integrated (projects that apply to both natural and cultural activities simultaneously) resources protection and information program currently funded at Montezuma Castle National Monument.

## PROJECT STATEMENT

1. Project Number: MOCA-I-01
2. Project Title: Natural and Cultural Resources Management and Administration
3. Servicewide Issue(s):

N24 - Other Issues (Administration of Program)  
C24 - Insufficient Professional Staff

4. Problem Statement: This project consists of the planning and supervisory activities of monument staff in conducting ongoing natural and cultural resources management activities in the area. Considering the small staff available to perform resources management functions at Montezuma Castle, administrative functions consume a large percentage of the allotted time. Hiring seasonals, supervising project teams, preparing funding justifications, preparing activity plans, purchasing supplies, etc. are all examples of some of the administrative functions performed.

Basic reoccurring management of cultural resources (museum objects, sites, structures, ethnographic, landscapes) includes maintenance, preservation, protection and interpretation of these resources for future generations in accordance with Cultural Resource Management Guideline NPS-28.

This cultural resource protection program includes:

- a. Maintain resources basic information: forms, records, studies.
- b. Coordination in archeological clearance program.
- c. Accomplish XXX compliance forms for undertakings.
- d. Coordination, Native American groups in planning/projects.
- e. Yearly review/updating museum scope of collections statement.
- f. Yearly review/updating of cultural resource priority lists, 10-238's.
- g. Yearly superintendent's annual report on significant events/accomplishments.
- h. Bi-yearly review/updating of cultural resource management plan with yearly updating of priority forms/accomplishments.
- i. Yearly museum collection inventory.

- j. Prepare responses to special reports and status on special program efforts.
- k. Nomination of personnel to cultural training courses.
- l. Inter-facing of cultural resource needs in Statement for Management and Outline of Planning Requirements.
- m. Request for funding of cyclic maintenance needs, accomplish maintenance if funded.
- n. Maintenance/protection of park special library and archives.
- o. Provide adequate storage, protection, environmental conditions to museum objects.
- p. Accomplish yearly (cyclic less than a year) maintenance of historic structures.
- q. Assure compliance with NEPA (1969) and NHPA (1966).

5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. This unacceptable alternative would entail a cessation of the minimum level of resource protection activities currently underway at the monument. This would be in direct violation of legislative and policy mandates of the Service.

b. Continue Functioning as at Present. Continue the current program with the same staffing and funding level, and with the same level of accomplishment as at present. This alternative maintains the status quo, but this has clearly been shown to be inadequate to properly manage both the cultural and natural resources from a substantial knowledge base and in a timely fashion over the longterm. Therefore, project statement MOCA-I-03 has been included in this plan to request additional support for an expansion of this effort. In the interim, however, the current program should be continued.

6. Description of the Recommended Project or Activity: Option b. is the recommended solution for this issue. This option would provide a minimum level of resource protection while the increase support called for in project statement MOCA-I-03 is being sought.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is the administrative foundation for all resources management activities in the monument. It is therefore related to every such function occurring or planned.

9. Funding Allocations: Funding is needed to support a full time position for natural and cultural resources management, with general program administration responsibilities being among the array of duties for this position. This need is described in MOCA-I-03, requesting funds to support this position. Listed below is the current level of expenditures out of the park base for this activity.

|                      | <u>FY 90</u> | <u>FY 91</u> | <u>FY 92</u> | <u>FY 93</u> | <u>FY 94</u> |
|----------------------|--------------|--------------|--------------|--------------|--------------|
| Personal Services    | \$14,000     | \$14,000     | \$14,000     | \$14,000     | \$14,000     |
| Travel and Per Diem  | 1,500        | 1,500        | 1,500        | 1,500        | 1,500        |
| Supplies & Materials | <u>0</u>     | <u>0</u>     | <u>0</u>     | <u>0</u>     | <u>0</u>     |
| Total                | \$15,500     | \$15,500     | \$15,500     | \$15,500     | \$15,500     |

10. Annual Project Status and Accomplishments: This report will be initiated once final determination is made by WASO on the proper Servicewide format.

## PROJECT STATEMENT

1. Project Number: MOCA-I-02
2. Project Title: Prepare a Management Plan for Prehistoric Sinagua Fields

3. Servicewide Issue(s):

N08 - Loss of Cultural Landscapes

4. Problem Statement: In prehistoric times, Sinagua people farmed the bench adjacent to the now Wet Beaver Creek in the Montezuma Well unit of Montezuma Castle National Monument. This bench supports a natural mesquite bosque community and is the upland area of the riparian zone, which is characterized by sycamore, velvet ash, walnut, and hackberry trees. During prehistoric times, the bench was extensively farmed with agricultural crops essential to the existence of the Sinaguas. A sophisticated system of irrigation ditches provided water; some portions of which are above ground and traceable. Project MOCA-C-06 pertains to studying this integrate irrigation system.

In historic times during the 1870s, this prehistoric field was the site of farm houses, barn, and outbuildings and of cultivated crops and occasional pasturing. Noted crops were hay, alfalfa, watermelon, cantaloupes, and personal gardens. In the 1939 National Park Service appraisal for Montezuma Well, the total land was listed as 179.43 acres with 41.22 acres irrigated (agricultural), 92.21 acres as grazing, and 46.00 as other uses. A ditch irrigation system distributed water, and some of it followed the prehistoric alignment.

When Montezuma Well was established, haying and pasturing on part of the land was continued. In the late 1940s it was noted that hay from Montezuma Well was baled and transported to Saguaro National Monument for use by government livestock.

The monument has rights to half the flow from the Well, which is expressed as using the water for alternate eight-day periods. Generally, rights were obtained for the State of Arizona on the basis of "beneficial uses", usually interpreted as agricultural, commercial or other economic uses. The monument diverts water for eight days then it flows through to downstream users for the following eight days. This pattern repeats. During winter the water primarily is diverted into Wet Beaver Creek. During summer, it irrigates the pasture and picnic area. The Water

Resources Division (Washington Office) is involved in the adjudication process for these water rights. They have been claimed for "ethnological interests" and "historical integrity."

Currently, there is a 27 acre parcel leased for cattle pasturing, a use that has supported the appropriated water rights of the Well for several decades. Sections of the historic irrigation system are still used. The current lessee operates with a special use permit and has used the pasture for several years. He is permitted to run 22 head of cattle from April 1 through November 30 and five cattle from December 1 through March 31. Pasture species are exotic grasses and forbs. The lessee also maintains the fences and the ditch (with a minimum of two hand clearings yearly). Upon termination of the lease, any improvements become property of the National Park Service. To date, there has been no assessment of cattle use levels, carrying capacity, or production of the pasture. The monument has not monitored to evaluated impacts of grazing or use levels of the pasture.

The authority to use the irrigated pasture for cattle is not provided for in any of the monument's legislation. The practice apparently comes from an assumption of nexus between farming and maintaining an irrigated pasture grazed by cattle. The earliest record is an August 17, 1954, memorandum from the Acting Assistant Director. It indicated that for a number of years prior to that date, special use permits were issued that allowed pasturing of cattle and horses. The assumption can be made that the practice has been followed from the time the National Park Service bought Montezuma Well property in 1947. The practice has continued to the present.

The problem is determining the appropriate use of the pasture considering prehistoric and historic uses as well as water rights, grazing impacts, protection of cultural and natural resources, and visitor and employee safety.

##### 5. Alternative Actions/Solutions and Their Probable Impacts:

a. No Action. This alternative entails maintaining the existing use levels of the pasture and current arrangements with the lessee. There would be no assessment of pasture value or grazing impacts. However, this alternative is precluded by Federal requirements for competitive leasing for special park uses, including agriculture and grazing. An environmental assessment is also needed for this consumptive use.

b. Assess Alternative Land Uses. This alternative involves considering other land uses and preparing an environmental assessment to evaluate those alternatives and select one. The alternatives will include, but not be limited to, 1) irrigated pasture with grazing, 2) irrigated meadow for hay without grazing, 3) irrigated hay meadow with some grazing, 4) cultivated alfalfa, corn, or other crop, and 5) restore native mesquite bosque community. For the alternative selected, a management plan will be written to direct actions.

6. Description of the Recommended Project or Activity. Option b. is the recommended solution for this issue. Monument and group office staff have already begun the process of gathering information for an environmental assessment. To date, old records have been gathered, review assistance has been obtained from an NPS range conservationist, and Soil Conservation Service range conservationists been on site twice to discuss agricultural land uses and professional practices with monument and group office staff. An assessment will be written and distributed for public and agency review and comment. After evaluating public and agency input, the Superintendent will select a land use. Following that, a management plan will be written as appropriate.

7. Compliance: This project will rewrite an environmental assessment. NHPA compliance under Section 106 may also be required so contact will be made with staff from the Western Archeological and Conservation Center.

8. Relationships: This project is related to at least five other projects listed in this plan. These are as follows:

|           |                                                                                 |
|-----------|---------------------------------------------------------------------------------|
| MOCA-N-15 | Conduct Inventory, Assessment, and Monitoring:<br>Vegetation and Flora          |
| MOCA-N-22 | Examination of Old Fields                                                       |
| MOCA-C-08 | Study Montezuma Castle Irrigation System                                        |
| MOCA-C-20 | Obtain Historic Photographs of Montezuma Castle                                 |
| MOCA-I-05 | Integrate Program for Long-Term Monitoring of<br>Cultural and Natural Resources |

9. Funding Requirements: Costs for preparing an environmental assessment will be supplied by monument and SOAR staff. Depending on the results of this assessment and the review process, funds may be requested to write and carry out the management plan. The estimated cost for monument is a total of \$1,000 in salaries and support for preparing the assessment. The estimated cost of involvement of the SOAR office staff is total of \$2,000 in salaries and support for preparing the assessment.

|                      | <u>FY 90</u> |
|----------------------|--------------|
| Personal Services    |              |
| MOCA base            | \$2,000      |
| SOAR base            | 2,000        |
| Travel and Per Diem  | 1,000        |
| Supplies & Materials | <u>0</u>     |
| Total                | \$5,000      |

10. Annual Project Status and Accomplishments; This report will be initiated once final determination is made by WASO on the proper Servicewide format.

Integrated Resources Project Statements: Unfunded Program

The following project statements are a description of the unfunded integrated (projects that apply to both natural and cultural activities simultaneously) resources protection and information program currently indentified for Montezuma Castle National Monument.

## PROJECT STATEMENT

1. Project Number: MOCA-I-03
2. Project Title: Increase Natural and Cultural Resources Management Staffing

3. Service-wide Issue(s):

C24 - Insufficient Professional Staff  
N24 - Other Issue (Program Staff Support)

4. Problem Statement: Basic management of natural and cultural resources for maintenance, preservation, protection and interpretation for future generations in accordance with *Cultural Resource Management Guideline NPS-28*, *Natural Resource Management Guideline NPS-77*, and *NPS Management Policies* (December 1988).

This project includes increasing support for the following types of activities in the monument:

- 1) Conduct monitoring of natural and cultural resources in monument.
- 2) Assist in oversight and review of research activities in monument.
- 3) Maintain resources basic information: forms, records, studies.
- 4) Assist in the coordination in Archeological Clearance Program.
- 5) Yearly review/updating Museum Scope of Collection Statement.
- 6) Yearly review/updating of resource management priority lists, 10-238's.
- 7) Assist in the biennial review/updating of Natural and Cultural Resource Management Plan.
- 8) Conduct yearly Museum Collection Inventory.
- 9) Prepare responses to special reports and status on special program efforts.

- 10) Interfacing of resource needs in Statement for Management and Outline of Planning Requirements.
- 11) Assist in providing adequate storage, protection, environmental conditions to park collections.
- 12) Assist in ensuring compliance with NEPA.
- 13) Assist in ensuring XXX forms and other NHPA compliance for all resource management activities.
- 14) Coordination, Native American groups in planning/projects.

5. Alternative Actions/Solutions and Their Probable Impacts:

- a. No Action. This option fails to provide the necessary level of resource management staff for the monument. Therefore, it is an unacceptable alternative.
- b. Increase Support to Allow Monument to Administer a Complete Program. This option would acquire one FTE of GS-7 Resources Management Specialist for Montezuma Castle (the position would also serve Tuzigoot National Monument). Such an action will meet goals of the NPS Organic Act of 1916, Endangered Species Act, National Historic Preservation Legislation, National Environmental Policy Act, NPS-28, NPS-77, USDI Standards/Guidelines, and administrative requirements.

6. Description of the Recommended Project or Activity: Option b. is the recommended solution for this issue. The new position would allow the superintendent to ensure the accomplishment of resources management protection that is in accordance with the NPS Organic Act of 1916 and other legal and administrative requirements.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of the Interior. NHPA compliance under section 106 is likewise not required for this project.

8. Relationships: This project is a keystone project that is related to all other projects listed in this plan.

9. Funding Requirements: This request is for a park base increase to provide FTE, salary, and support costs for a GS-7 Resources Management Specialist.

|                     | <u>Year 1</u> | <u>Year 2</u> | <u>Year 3</u> | <u>Year 4</u> | <u>Year 5</u> |
|---------------------|---------------|---------------|---------------|---------------|---------------|
| Personal Services   | \$26,000      | \$26,000      | \$26,000      | \$26,000      | \$26,000      |
| Travel and Per Diem | 4,000         | 4,000         | 4,000         | 4,000         | 4,000         |
| Project Support     | <u>30,000</u> | <u>30,000</u> | <u>30,000</u> | <u>30,000</u> | <u>30,000</u> |
| Total               | \$60,000      | \$60,000      | \$60,000      | \$60,000      | \$60,000      |

10. Annual Project Status and Accomplishments: This report will be initiated once final determination is made by WASO on the proper Servicewide format.

## PROJECT STATEMENT

1. Project Number: MOCA-I-04

2. Project Title: Develop Bibliographic Assessment and  
Computerized Bibliographic Information  
Retrieval System

3. Service-wide Issue(s):

N20 - Lack of Basic Data: Insufficient Understanding of Park  
Ecosystems and Threats to Them  
C01 - Inadequate Planning Documents

4. Problem Statement: Sociological, physical, and natural changes at Montezuma Castle National Monument are adversely impacting the monument. Historically, various studies have been conducted since the monument was established in 1906. Currently, the monument does not have the ability to efficiently track the wealth of historic, technical and ecological information that is available. Without the development of an adequate tracking system and information base, park management cannot efficiently manage the resource or respond to developing resource issues. In addition, public interest and environmental groups frequently request bibliographic citations and or information upon which management actions were based. Researchers and other professionals routinely depend upon and utilize the monument's information base as the first step in addressing management concerns. The development of a computerized bibliographic system and the production of an annotated bibliography will place the monument in a better position to assess past actions, evaluate current programs, and identify potential resource management problems.

5. Alternative Actions/Solutions and Their Probable Impacts:

a. Develop a Computerized Bibliographic Information System. This will increase management's ability to respond effectively to cultural and natural resource issues. An adequate information base can prevent duplication of effort and prevent costly mistakes. Adequate and effective access to informational resources are a mandatory prerequisite for efficient and cost effective management. The time frame for evaluating resource issues can be significantly reduced with an annotated bibliography and the creation of a computer information tracking system. In addition, the bibliographic assessment would identify

strengths and weaknesses in the existing information base. Information management is a critical first step in developing cost effective solutions. Also, this system will serve to maintain a comprehensive resource data base.

b. No Action. With this alternative the monument will not have adequate access to current or past informational resources. This increases the time and reduces the cost effectiveness of managements ability to evaluate resource issues.

6. Description of the Recommended Project or Activity: Option a. is the recommended solution for this issue. Develop a computerized bibliographic system and produce an annotated bibliography. As stated above the bibliography would summarize strengths and weaknesses in the existing information base. This action would increase the effectiveness of all management programs.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is a keystone project that supports all Cultural and Natural Resource management activities and programs in the monument.

9. Funding Requirements:

|                   | <u>Year 1</u> |
|-------------------|---------------|
| Personal Services | \$ 5,500      |
| Capital Equipment | 4,900         |
| Computer Time     | 700           |
| Publication Costs | <u>500</u>    |
| Total             | \$11,600      |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

## PROJECT STATEMENT

1. Project Number: MOCA-I-05
2. Project Title: Integrate Program of Long-term Monitoring for Cultural and Natural Resources
3. Service-wide Issue(s):  
N20 - Lack of Basic Data: Insufficient Understanding of Park Ecosystems and Threats to Them  
C19 - Inadequate Cultural Resources Monitoring Programs
4. Problem Statement: This resources management plan calls for the conduct of a wide variety of studies to delineate and quantify cultural and ecological values of Montezuma Castle National Monument. These studies will also recommend long-term monitoring protocols for each of the respective components. However, if these individual protocols are not integrated into a coherent and unified program for the monument the value of these studies is greatly depreciated. Monitoring can provide the superintendent with a direct measure of the health and stability of the monument's resources. Such an integrated monitoring program must be carefully designed and coordinated in order to minimize the costs while maximizing the returns. This project is needed in order to focus the necessary professional judgement and experience on this specific resources management problem in a manner that can address the multidisciplinary needs of the program and provide for the staff needed to implement an integrated monitoring effort.
5. Alternative Actions/Solutions and Their Probable Impacts:
  - a. No Action. This option entails continuing to operate the monument without any systematic or programmatic long-term monitoring program. Periodic inspections of the major ruins are conducted and cyclic maintenance is carried out on them. However, no monitoring of the natural resources that constitute the "scene" for Montezuma Castle has been designed or implemented.
  - b. Integrate Individual Monitoring Protocols into a Unified Long-Term Monitoring Program. This option would ensure that the superintendent and staff are able to manage Montezuma Castle natural resources from an empirical knowledge base. Informed decisions are more likely to protect the historic scene in the monument over the long run than are educated guesses and intuition. Currently, such a monitoring system does not exist.

6. Description of the Recommended Project or Activity: Option b. is the recommended solution for this issue. The first step in this project is to evaluate the several protocols that will be developed individual studies outlined in this plan (MOCA-N-21, -22, -23, -25, -26, -27, -28, -34, and MOCA-C-15, -16, -17). The best of these protocols should be integrated into an overall long-term monitoring program for the monument to provide an empirical assessment of general ecosystem health and trends. In an area as small as Montezuma Castle and its associated Montezuma Well unit this monitoring system should be designed to be relatively simple but effective. The monument is not likely to gain the staff necessary to conduct an intense and detailed monitoring system. Therefore, emphasis will be on simplicity by focusing on only the most useful components for reflecting general ecological condition. Finally, the funds necessary for training park staff and implementing this monitoring program must be obtained in the monument base budget.

7. Compliance: This project is categorically excluded from NEPA compliance, Departmental Categorical Exclusions, 516 DM, Chapter 2, Appendices 1 and 7, U.S. Department of Interior. NHPA compliance under Section 106 is likewise not required for this project.

8. Relationships: This project is related to at least ten other projects listed in this plan. These are as follows:

|           |                                                                                                |                         |
|-----------|------------------------------------------------------------------------------------------------|-------------------------|
| MOCA-N-15 | Conduct inventory and Assessment:                                                              | Vegetation and Flora    |
| MOCA-N-16 | Conduct Inventory and Assessment:                                                              | Invertebrates           |
| MOCA-N-17 | Conduct inventory and Assessment:                                                              | Amphibians and Reptiles |
| MOCA-N-18 | Conduct inventory and Assessment:                                                              | Birds                   |
| MOCA-N-19 | Conduct inventory and Assessment:                                                              | Soils                   |
| MOCA-N-20 | Conduct inventory and Assessment:                                                              | Mammals                 |
| MOCA-N-21 | Conduct inventory and Assessment:                                                              | Non-native Species      |
| MOCA-N-24 | Evaluate Effects of Hydrologic Characteristics on Regeneration of Vegetation in Riparian Areas |                         |
| MOCA-N-26 | Conduct inventory and Assessment:                                                              | Fishes                  |
| MOCA-I-04 | Develop Bibliographic Assessment and Computerized Bibliographic Information Retrieval System   |                         |

9. Funding Requirements:

Year 1 - Contract to design and test program - \$35,000

Year 2+ - Permanent increase of \$8,500 to park base to implement the integrated monitoring program. This money is to provide seasonal support for the permanent Resources Management position requested under project statement MOCA-I-03 in implementing the monitoring program.

|                                     | <u>Year 1</u> | <u>Year 2</u> | <u>Year 3</u> | <u>Year 4</u> | <u>Year 5</u> |
|-------------------------------------|---------------|---------------|---------------|---------------|---------------|
| Contract to design and test program | \$35,000      | \$ 0          | \$ 0          | \$ 0          | \$ 0          |
| Personal Services                   | 0             | 7,000         | 7,000         | 7,000         | 7,000         |
| Travel and Per Diem                 | 0             | 500           | 500           | 500           | 500           |
| Supplies & Materials                | <u>0</u>      | <u>1,000</u>  | <u>1,000</u>  | <u>1,000</u>  | <u>1,000</u>  |
|                                     | \$35,000      | \$8,500       | \$8,500       | \$8,500       | \$8,500       |

10. Annual Project Status and Accomplishments: This report will be initiated once action begins on a project.

APPENDIX 1

PARK CULTURAL RESOURCES STATUS SUMMARY CHARTS

MONTEZUMA CASTLE NATIONAL MONUMENT

SUMMARY CHART FOR ARCHEOLOGICAL SITES

| Significance       |       |         | Condition |      |      |      |      | Impacts |      |     |      | Documentation |      |      |
|--------------------|-------|---------|-----------|------|------|------|------|---------|------|-----|------|---------------|------|------|
|                    | Total | Acreage | Good      | Fair | Poor | Des. | Unk. | Sev.    | Mod. | Low | Unk. | Good          | Fair | Poor |
| National           | 64    | 825     | 59        | 4    | 1    |      |      | 4       | 20   | 39  | 1    | 63            |      | 1    |
| State and Regional |       |         |           |      |      |      |      |         |      |     |      |               |      |      |
| Local              |       |         |           |      |      |      |      |         |      |     |      |               |      |      |
| Not Evaluated      | 2     |         | 2         |      |      |      |      |         |      | 1   | 1    | 2             |      |      |
| TOTALS             | 66    | 825     | 61        | 4    | 1    |      |      | 4       | 20   | 40  | 2    | 65            |      | 1    |

MONTEZUMA CASTLE NATIONAL MONUMENT

SUMMARY CHART FOR STRUCTURES

| Significance   |       | Condition |      |      |      | Impacts |      |      |      | Documentation |      |      |
|----------------|-------|-----------|------|------|------|---------|------|------|------|---------------|------|------|
|                | Total | Good      | Fair | Poor | Unk. | Sev.    | Mod. | Low. | Unk. | Good          | Fair | Poor |
| National       | 8     | 7         | 1    | 0    | 0    | 0       | 1    | 7    | 0    | 1             | 0    | 7    |
| National Cont. |       |           |      |      |      |         |      |      |      |               |      |      |
| State          |       |           |      |      |      |         |      |      |      |               |      |      |
| Local          |       |           |      |      |      |         |      |      |      |               |      |      |
| Undetermined   | 3     | 2         | 0    | 1    | 0    | 1       | 0    | 2    | 0    | 0             | 0    | 3    |
| TOTALS         | 11    | 9         | 1    | 1    | 0    | 1       | 1    | 9    | 0    | 1             | 0    | 10   |

MONTEZUMA CASTLE NATIONAL MONUMENT

SUMMARY CHART FOR OBJECTS

| Documentation*              | ARCH | ETHN | HIST | ARCHV | BIOL | PALEO | GEOL | Total |
|-----------------------------|------|------|------|-------|------|-------|------|-------|
| Registration Date Only      |      |      |      |       |      |       |      |       |
| Registration & Catalog Data | 450  | 24   | 22   |       | 555  |       |      | 1151  |
| Total Items Cataloged       | 450  | 24   | 22   |       | 555  |       |      | 1151  |
| Backlog to be Cataloged     | 3    |      |      |       |      |       |      | 3     |
| Total Collection Summary    | 453  | 24   | 22   |       | 555  |       |      | 1154  |

\*Form 10-254 Submitted to National Catalog at Harpers' Ferry

| Condition** | ARCH | ETHN | HIST | ARCHV | BIOL | PALEO | GEOL |
|-------------|------|------|------|-------|------|-------|------|
| Excellent   | 8    | 10   |      |       | 74   |       |      |
| Good        | 540  | 14   | 10   |       | 369  |       |      |
| Fair        | 5    |      | 12   |       | 112  |       |      |
| Poor        |      |      |      |       |      |       |      |
| Unknown     |      |      |      |       |      |       |      |

\*\*The Percentage of Collection in the Following Categories

MONTEZUMA CASTLE NATIONAL MONUMENT

SUMMARY CHART FOR CULTURAL LANDSCAPES

| Significance       |       |         | Condition |      |      |      |      | Impacts |      |     |      | Documentation |      |      |
|--------------------|-------|---------|-----------|------|------|------|------|---------|------|-----|------|---------------|------|------|
|                    | Total | Acreage | Good      | Fair | Poor | Des. | Unk. | Sev.    | Mod. | Low | Unk. | Good          | Fair | Poor |
| National           |       |         |           |      |      |      |      |         |      |     |      |               |      |      |
| State and Regional |       |         |           |      |      |      |      |         |      |     |      |               |      |      |
| Local              |       |         |           |      |      |      |      |         |      |     |      |               |      |      |
| Not Evaluated      | 1     |         |           |      |      |      |      |         |      | 1   |      |               | 1    |      |
| TOTALS             | 1     |         |           |      |      |      |      |         |      | 1   |      |               | 1    |      |

APPENDIX 2

CULTURAL RESOURCES DOCUMENTATION CHECKLIST

MONTEZUMA CASTLE NATIONAL MONUMENT

CULTURAL RESOURCE DOCUMENTATION CHECKLIST

| TITLE                                                              | CURRENT<br>AND<br>APPROVED | NEEDS<br>REVISION | NEEDED |
|--------------------------------------------------------------------|----------------------------|-------------------|--------|
| <b>PLANNING DOCUMENTS</b>                                          |                            |                   |        |
| Preauthorization and Authorization                                 | NA                         |                   |        |
| Statement for Management (SFM)                                     | X                          |                   |        |
| Outline for Planning Requirements (OPR)                            | X                          |                   |        |
| General Management Plan (GMP)                                      |                            | X                 |        |
| Development Concept Plan (DCP)                                     |                            |                   | X      |
| Resources Management Plan (RMP)                                    | X                          |                   |        |
| Interpretive Prospectus (IP)                                       |                            |                   | X      |
| <b>SERVICEWIDE INVENTORIES, LISTS,<br/>CATALOGS, AND REGISTERS</b> |                            |                   |        |
| Cultural Resources Bibliography (CRBIB)                            |                            | X                 |        |
| Cultural Sites Inventory (CSI)                                     |                            | X                 |        |
| List of Classified Structures (LCS)                                |                            | X                 |        |
| National Catalog of Museum Objects                                 |                            | X                 |        |
| National Register of Historic Places                               |                            |                   | X      |
| <b>BASIC CULTURAL RESOURCE DOCUMENTS</b>                           |                            |                   |        |
| Archeological Overview and Assessment                              |                            | X                 |        |
| Archeological Identification Studies                               | X                          |                   |        |
| Archeological Evaluation Studies                                   | X                          |                   |        |
| Ethnographic Overview and Assessment                               | NA                         |                   |        |
| Ethnographic Oral Hist. & Life Hist.                               | NA                         |                   |        |

MONTEZUMA CASTLE NATIONAL MONUMENT

CULTURAL RESOURCE DOCUMENTATION CHECKLIST

| TITLE                                            | CURRENT<br>AND<br>APPROVED | NEEDS<br>REVISION | NEEDED |
|--------------------------------------------------|----------------------------|-------------------|--------|
| <b>BASIC CULTURAL RESOURCE DOCUMENTS (cont.)</b> |                            |                   |        |
| Ethnographic Program                             | NA                         |                   |        |
| Historical Base Map                              |                            | X                 |        |
| Historic Resource Study (HRS)                    |                            | X                 |        |
| Park Administrative History                      |                            | X                 |        |
| Scope of Collection Statement                    | X                          |                   |        |
| <b>SPECIAL RESOURCE STUDIES AND PLANS</b>        |                            |                   |        |
| Archeo. & Ethno. Collections Studies             |                            |                   | X      |
| Archeological Data Recovery Studies              |                            |                   | X      |
| Collection Management Plan                       |                            |                   | X      |
| Collection Storage Plan                          | NA                         |                   |        |
| Collection Condition Survey                      |                            |                   | X      |
| Cultural Landscape Report (CLR)                  | NA                         |                   |        |
| Ethnohistory                                     | NA                         |                   |        |
| Exhibit Plan                                     | NA                         |                   |        |
| Historic Furnishings Report                      | NA                         |                   |        |
| Hist. Struct. Preservation Guide (HSPG)          |                            |                   | X      |
| Historic Structure Report                        | NA                         |                   |        |
| Social Impact Study                              | NA                         |                   |        |
| Special History Study                            | NA                         |                   |        |
| Traditional Use Study                            | NA                         |                   |        |

APPENDIX 3

LIST OF COMPLETED PROJECTS

|                             |                 |                 |
|-----------------------------|-----------------|-----------------|
| FY88 - Archeological Survey | Fee Enhancement | \$25,000        |
| FY87 - Reroof Residences    | Cultural Cyclic | \$17,000        |
| FY86 - CM Prehistoric Ruins | Cultural Cyclic | \$ 2,000        |
| FY85 - Ruins Maintenance    | Cultural Cyclic | \$ 1,000        |
| FY84 - Ruins Maintenance    | Cultural Cyclic | <u>\$ 1,000</u> |
|                             | Five Projects:  | \$46,000        |

APPENDIX 4

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