

II.1 Introduction

(See Section 1 of the current Nomination Form and Section 1, 2, and 3 of the original Nomination Forms)

1a) State Party:
USA

1b) Name of World Heritage property:
Mammoth Cave National Park

1c) Please provide geographical coordinates for the site to the nearest second. (In the case of large sites, please give three sets of geographical coordinates.)

Geographical coordinate: Longitude: 86 07'30 W, Latitude: 37 17'30 N

1d) Give date of inscription on the World Heritage List.

date (dd/mm/yyyy): 27/10/1981

1e) Give date of subsequent extension(s), if any.

1f) List organization(s) responsible for the preparation of this site report.

Organization #1

Organization Name: Mammoth Cave National Park
Last Name: Switzer
First Name: Ronald
Title: Superintendent
Address: P.O. Box 7
City: Mammoth Cave
State/Prov: KY
Postal Code: 42259
Telephone: 270-758-2185
Fax: 270-758-2349
Email: ron_switzer@nps.gov

II.2 Statement of Significance (see Section 2 of the current Nomination Form and Section 5 of the original Form)

2a) When a State Party nominates a property for inscription on the World Heritage List, it describes the heritage values of the property which it believes justifies the inscription of the property on the World Heritage List. Please summarize the justification for inscription as it appears in the original nomination of the property.

In the 1980 nomination for Mammoth Cave National Park, inscription was justified on three of the Natural Criteria (criteria i, iii, and iv). The following paragraphs summarize the justification for inscription as documented in the original nomination:

Criteria i

Mammoth Cave National Park was inscribed under criteria i for containing limestone rock deposits over 300 million years in age that are capped with layers of sandstone, shale, and additional limestone. Waters, now known as the Green River, are believed to have flowed along its present course for nearly 100 million years. During the last 10 to 20 million years, the river has been entrenching itself through the sandstone and into the limestone. Underground tributaries developed as the water worked its way under the capped layer and into the limestone. As the river and its erosional processes cut deeper into the bedrock, the surrounding water table was lowered; thus, passages that were once water-filled, dried up. Today this huge and complex network of 365 miles (587 km) of cave passages provides park visitors with a clear and most complete record of the geomorphic and climatic changes of any readily accessible continental feature in the world. In these passages are recorded the history of development of the layers of rock and is one of the few places in the world where man can literally walk through time in an environment not familiar to him.

Criteria iii

Mammoth Cave National Park was inscribed under criteria iii for the superlative examples of natural features that exist within the cave and surface estate. Even before Mammoth Cave obtained National Park status, it was world renowned for its size and vast network of passages. Extremely large horizontal passages, ranging in width and height up to 100 feet (30 m), make up mile after mile of the system. Connected to the lengthy horizontal passages are hundreds of vertical shafts, often extending over 25 feet (8 m) in width and over 100 feet (30 m) in height.

Currently 365 miles (587 km) in length, Mammoth Cave encompasses the most extensive networks of cave passages on earth. No other cave system can provide such a natural laboratory. By the end of 1980, 225 miles (362 km) of cave passages had been surveyed. New passages with unique formations are continually being found. Over 140 additional miles (225 km) of cave passage have been mapped since inscription, and many more miles of cave will be added to the system.

The geologic process that accounted for the longest known cave is also responsible for creating the premiere model karst system on earth. All of the features of a karst drainage system including a vast recharge area, a complex network of underground conduits, and springs that discharge water from the recharge area and the conduits exist within the Mammoth Cave region. Surface water collects in the numerous sinkholes on the Sinkhole Plain and flows horizontally underground toward the Green River where it eventually reappears in springs along the river. The extensive network of conduits and unique underground features has been preserved because of the impermeable cap-rock.

Within the cave system, splendid forms of beautiful gypsum flowers, delicate gypsum needles, and rare mirabilite flowers decorate many of its passages. The rich abundance of these sulfate minerals and other rare minerals is unique. No other known cave system in the world offers a greater variety of sulfate minerals. In fact, some may exist nowhere else.

Criteria iv

Mammoth Cave National Park was inscribed under criteria iv for having an ecosystem in which concentrations of plants and animals of universal interest and significance are found. Nowhere on earth does any cave system offer a richer variety of organisms.

In 1825, a famed French naturalist, Constantine Rafinesque, visited the area and wrote about its bats and salamanders. The world's first known eyeless cavefish (*Amblyopsis spelaea*) was discovered in 1842. Other eyeless cave animals, including a crayfish, beetle, spider, and harvestman, were collected as early as 1842-1844. Mammoth Cave has the most diverse ecosystem of unique and fragile cave fauna in the world.

Of the 200+ species of fauna within Mammoth Cave, 22 percent are troglobites, 36 percent are troglaphiles, 22 percent are troglaxenes, and 20 percent are accidentals. Other organisms include 67 species of algae, 27 species of fungi, and 7 species of twilight-zone bryophytes. Fourteen species of troglobites or troglaphiles are found only in Mammoth Cave National Park and its immediate vicinity. The extensive large cave system--with five cave levels--provides ample food and habitat and accounts for the variety of underground life. The geological setting also contributes to its species richness; the cave system is old enough to have stable communities with fauna from three karst regions within an area large enough for speciation to have occurred. Nowhere else do two eyeless fish – the *Amblyopsis spelaea* and the *Typhlichthys subterraneus* – and their spring-cave dwelling relative – the *Chologaster agassizi*, co-exist. The first two species are classic examples of species used to document the phenomenon of regressive evolution of visual systems. Their survival is highly dependent upon the normal flow of water into their habitat and upon the absence of water-borne pollutants.

The 1980 World Heritage Nomination made special reference to a potentially endangered species of colorless, eyeless, freshwater shrimp (*Palaemonias ganteri*). It was subsequently listed as an endangered species because unnatural flooding and/or pollution have reduced the limited suitable microhabitat used by this species. The shrimp, being at the end of the food chain, is of special concern to park managers as it is considered an indicator species for an entire ecosystem. In summary, the populations of rare, fascinating, and unique animal life found at Mammoth Cave have made it world-renowned.

2b) *At the time of initial inscription of a property on the World Heritage List, the World Heritage Committee indicates the property's outstanding universal value(s) (or World Heritage value(s)) by agreeing on the criteria for which the property deserves to be included on the World Heritage List. Please consult the report of the World Heritage Committee meeting when the property was listed and indicate the criteria for which the Committee inscribed the property on the World Heritage List. (Choose one or more boxes.)*

Cultural Criteria

- i
- ii
- iii
- iv
- v
- vi

Natural Criteria

- i
- ii
- iii
- iv

2c) *At the time of initial inscription, did the World Heritage Committee agree upon a Statement of Significance for the WHS? (Consult the report or minutes of the World Heritage Committee meeting when the property was listed.)*

NO

2c1) *If YES, please cite it here.*

2c2) If NO please propose a Statement of Significance for the World Heritage Site based on the consideration given the property by the Committee when it inscribed the property on the World Heritage List. (Note: Following the completion of the Periodic Report exercise, the State Party, in consultation with appropriate authorities, will determine whether to proceed with seeking a Committee decision to approve any proposed Statement of Significance. The Committee must approve any proposed Statement of Significance through a separate, formal process. See 7g.)

Proposed Statement of Significance:

Criteria i, iii, iv

Mammoth Cave National Park is the core of the largest, most complex, and best known karst area in the world. With 365 miles of passageways that have been surveyed and mapped, Mammoth Cave is the longest cave system in the world. Mammoth Cave is world renowned for its size and vast network of extremely large horizontal passages and vertical shafts. The many types of geologic features present within the cave system are the product of karst topography found nowhere else.

Mammoth Cave National Park contains an unusual variety of ecological niches that provide habitat for an abundance of plants and animals. The park and the surrounding area are part of what is believed to be the most diverse cave ecosystem in the world. Of the more than 200 species of fauna within the cave system, fourteen species of troglobites or troglaphiles are known to exist only within Mammoth Cave and other caves in the immediate vicinity. Overall, the park provides habitat for twelve species listed as endangered. Mammoth Cave National Park also contains an array of world-class cultural resources.

It is significant that the entire boundary of the World Heritage Site designation for Mammoth Cave was subsequently designated as the core property of the Mammoth Cave Area International Biosphere Reserve. Extending outside the World Heritage Site boundary, the Biosphere Reserve designation also includes a zone of cooperation that encompasses the Mammoth Cave watershed in order to preserve the same universal values as those that exist within the World Heritage designation.

2d) Since the original inscription of the property on the World Heritage List, has the World Heritage Committee agreed with a proposal by the State Party that the property be recognized for additional World Heritage values and added additional criteria to the inscription as a result of a re-nomination and/or extension of the property?

NO

*2d1) If YES, please indicate which new criteria were added and the date.
(dd/mm/yyyy)*

II.3 Statement of Authenticity / Integrity
(See Section 2 of the current Nomination Form and Section 4 of the original Form)

3a) In addition to meeting one or more of the criteria, which justify inscription on the World Heritage List, a natural or cultural property must meet the appropriate conditions of authenticity and/or integrity, as defined in clauses 24b and 44b of the Operational Guidelines for Implementing the World Heritage Convention. If at the time of inscribing the property on the World Heritage list, the State Party and the International Council on Monuments and Sites, ICOMOS and/or the International Union for Conservation of Nature and Natural Resources, IUCN, evaluated the authenticity and integrity of the property, please cite those evaluations here. (Please quote directly from the nomination, Committee minutes, and the Advisory Body's evaluation.)

At the time of inscription, Mammoth Cave National Park received a technical evaluation from IUCN to document the authenticity and integrity of the nomination. In addition, the original nomination included an extensive amount of supporting information on the authenticity and integrity of the property. In keeping with the clause 44b of the operational guidelines for the implementation of the World Heritage Convention, nominated sites should achieve seven "conditions for integrity." The following paragraphs provide a summary of this documentation.

Integrity criteria i

Mammoth Cave National Park is the core of the largest, most complex, and best known karst area in the world. According to the original nomination: "Mammoth Cave National Park contains the most extensive cavern system and some of the finest examples of karst topography in the world." The park contains most of key interrelated and interdependent elements in their natural relationships. Most of the cave system and its extraordinary and superlative natural features are within the park's boundaries along with the historic section of Mammoth Cave and most cultural resources. The park contains 52,830 acres of surface estate, which provides a contiguous area for park ecological and terrestrial systems.

Integrity criteria ii

In the Integrity section of the 1981 IUCN technical review, the report concluded that: "the site includes the entire cave system, thus meeting criteria 21 (ii) and (iii)." In 1981, all of the 225 miles (362 km) of mapped cave passage were within the boundaries of Mammoth Cave National Park. In the 22 years since inscription, approximately 140 additional miles (225 km) of cave passage have been discovered and mapped, including about 80 miles (129 km) of cave passage that is located outside of park boundaries. Presently, 22 percent of Mammoth Cave is located outside of park boundaries.

The 1981 technical review also noted that Mammoth Cave “does not include the entire river catchment of waters flowing through the site.” Mammoth Cave is embedded within a subterranean drainage basin covering more than 1050 square kilometers (400 square miles). A large portion of the drainage basin for Mammoth Cave is located outside the boundaries of Mammoth Cave National Park. Yet, the entire area of the drainage basin was included within the boundaries of the Mammoth Cave Area Biosphere Reserve, which was established in 1990. The Biosphere Reserve Area designation has contributed to regional efforts to promote the long-term preservation of Mammoth Cave. Similarly, the larger river basin of the entire Green River is predominantly outside the park, yet efforts continue to the enhance the naturalness and water quality of this river system. In recent years, water quality monitoring efforts along the Green River have been expanded. And the Upper Green River Area will benefit from the Green River Conservation Reserve Enhancement Project, which has been funded by the Department of Agriculture.

Integrity criteria iii

The original nomination form stated: “[e]ven before Mammoth Cave obtained National Park status, it was world renowned for its size and vast network of passages. Extremely large horizontal passages, ranging in width and height up to 100 feet, make up mile after mile of the system. Connected to the lengthy horizontal passages are hundreds of vertical shafts often extending over 25 feet (8 m) in width and over 100 feet (30 m) in height.” The nomination report continued: “[w]ithin the cave system, splendid forms of beautiful gypsum flowers, delicate gypsum needles, and rare mirabilite flowers decorate many of its passages. ...No other known cave system in the world offers a greater variety of sulfate minerals. In fact, some may exist nowhere else.” The IUCN report concludes: “[t]he limestone caverns of Mammoth Cave contain a natural spectacle of world interest.”

Integrity criteria iv

The original nomination stated: “Nowhere on earth does any cave system offer a richer variety of organisms. In fact, few cave systems can match the intensive biological studies that have occurred at Mammoth Cave. ...Mammoth Cave has the most diverse ecosystem in the world. ...Twelve species of troglobites or troglophiles are found only in Mammoth Cave National Park and its immediate vicinity. The extensive large cave system with five cave levels provides ample food and habitat and accounts for the variety of underground life. The geological setting also contributes to its species richness in that the cave system is old enough to have stable communities with fauna from three karst regions within an area large enough for speciation to have occurred. ...For many, the true significance of Mammoth Cave rests with its fascinating and unique animal life. Indeed, the large populations of rare animals found at Mammoth Cave have made it world renowned.”

The original nomination made special reference to a potentially endangered species of colorless, eyeless, freshwater shrimp (*Paleomonias ganteri*). It was subsequently listed as an endangered species because unnatural flooding and/or pollution have reduced the limited suitable microhabitat used by this species. In summary, the populations of rare, fascinating, and unique animal life found at Mammoth Cave have made it world-renowned.

Integrity criteria v

At the time of inscription, Mammoth Cave National Park had a completed management plan. Since inscription, the management plan for Mammoth Cave National Park has been updated and revised.

Integrity criteria vi

As a unit of the National Park System, Mammoth Cave National Park has significant legislative and regulatory protection. The park is governed by agency policies to ensure the long-term preservation while allowing for public use of the site. At the time of inscription, it was determined that the size of Mammoth Cave National Park was sufficient to include most areas of outstanding universal value to protect the site's heritage values. However, it was acknowledged in the IUCN report that Mammoth Cave "does not include the entire river catchment of waters flowing through the site." While most of the hydrologic recharge area for Mammoth Cave is located outside of Mammoth Cave National Park, this area has been designated within the boundaries of the Mammoth Cave Area Biosphere Reserve. The Biosphere Reserve Area designation has contributed to regional efforts to promote the long-term preservation of Mammoth Cave. Similarly, the larger river basin of the entire Green River is predominantly outside the park, yet efforts continue to enhance the naturalness and water quality of this river system. In recent years, water quality monitoring efforts along the Green River have been expanded. The Upper Green River Area will benefit from the Green River Conservation Reserve Enhancement Project, which has been funded by the Department of Agriculture.

Integrity criteria vii

The nomination form provides extensive documentation on this criterion: "[n]owhere on earth does any cave system offer a richer variety of organisms. In fact, few cave systems can match the intensive biological studies that have occurred at Mammoth Cave. ...Mammoth Cave has the most diverse ecosystem in the world. ...Twelve species of troglobites or troglaphiles are found only in Mammoth Cave National Park and its immediate vicinity. The extensive large cave system with five cave levels provides ample food and habitat and accounts for the variety of underground life. The geological setting also contributes to its species richness in that the cave system is old enough to have stable communities with fauna from three karst regions within an area large enough for speciation to have occurred. ...For many, the true significance of Mammoth Cave rests with its fascinating and unique animal life. Indeed, the large populations of rare animals found at Mammoth Cave have made it world renowned." The IUCN report concludes: "[m]ammoth Cave system is well over twice as long as the next -largest cave system... 'No other cave system in the world can be compared with it.'"

3b) Have there been significant changes in the authenticity or integrity of the property since inscription?

YES

3b1) If YES, please describe the changes to the authenticity or integrity and name the main causes.

Since inscription in 1981, three significant changes have occurred. Each bolsters the authenticity and integrity documentation for Mammoth Cave National Park, as defined in section 44b of the Operational Guidelines for Implementing the World Heritage Convention. A summary of these three changes is provided in the following paragraphs.

Establishment of the Mammoth Cave Area Biosphere Reserve

Mammoth Cave Area Biosphere Reserve was established on March 27, 1990. Initially, the Biosphere Reserve contained 112,800 acres (45,649 ha). The core area of the Biosphere Reserve mirrored the boundaries of the World Heritage Site designation by containing all 53,830 acres (21,784 ha) within the park. An additional 59,970 acres (24,269 ha) was included in the Biosphere Reserve boundary as the zone of cooperation. This acreage contained a large portion of the groundwater recharge area that surrounds much of the park.

In April, 1996, the boundary of Mammoth Cave Area Biosphere Reserve was significantly expanded to 909,328 acres (367,993 ha), land of six counties near Mammoth Cave National Park. With this expansion, the core area of the Biosphere Reserve remained as the park boundary. The zone of cooperation was expanded to 94,365 acres (38,188 ha), and an interaction zone of 762,133 acres (308,426 ha) was established. The interaction zone was created because of a common concern about water quality.

The establishment of Mammoth Cave Area Biosphere Reserve adds additional support to criteria i, ii, iii, v, vi, and vii of section 44b of the Operational Guidelines for Implementing the World Heritage Convention. Essentially, the 1996 boundaries of the Mammoth Cave Area Biosphere Reserve fully include the hydrological recharge area for Mammoth Cave National Park as well as a large interaction zone. This designation, combined with numerous cooperative projects implemented to achieve the goals of the Biosphere Reserve, have enhanced the integrity and authenticity of Mammoth Cave National Park's listing as a World Heritage Site.

Discovery and Survey of 140 miles (225 km) of additional cave passage

Since Mammoth Cave National Park's inscription as a World Heritage Site in 1981, many additional miles of cave passage have been discovered, surveyed, and mapped. The total length of surveyed passageways within Mammoth Cave in 1981 was 225 miles (362 km), which was more twice the length of the second longest cave in the world. In 2003, the total length of surveyed passageways is 365 miles (587 km); Mammoth Cave is now more than three times the length of the second longest cave in the world.

Since 1981, additional cave passages were discovered in many areas. In particular, following the 1983 connection between Mammoth Cave and the Roppel Cave system, the total length of Mammoth Cave increased to 296 miles (475 km). Subsequent discoveries in other locations have increased the surveyed length of Mammoth Cave to 365 miles. It should be noted that the 140 additional miles (225 km) of passage that have been discovered and mapped in the past 23 years includes 80 miles (129 km) of cave passage that exist outside the boundary of Mammoth Cave National Park. With the existence of 100+ miles (161 km) of additional mapped cave systems in very close proximity to Mammoth Cave, it is likely that the length of Mammoth Cave may exceed 600 miles (966 km) in the next decade. Some experts predict the length of Mammoth Cave may ultimately exceed 1,000 miles (1609 km).

As a result of the significant number of miles of additional cave passages that have been discovered, and the existence of 100+ miles of passages of additional nearby passageways that are very close to being connected to Mammoth Cave, the authenticity and integrity of the area is enhanced. Specifically, the discovery of additional cave passageways provides additional support to criteria i, ii, iii, v, and vii of section 44b of the Operational Guidelines for Implementing the World Heritage Convention.

Approval of the General Management Plan in 1983

Criteria iv, within section 44b of the Operational Guidelines for Implementing the World Heritage Convention, emphasizes the need for a management plan.

At the time of inscription, Mammoth Cave National Park had completed a "Master Plan," which was approved in 1976. Subsequent to inscription, the 1976 Master Plan was superseded with the preparation of a General Management Plan in 1983. This document provides for the comprehensive and long-term management and preservation of resources within Mammoth Cave National Park while allowing for expanded enjoyment and public use.

As a result of the overall direction of the 1983 General Management Plan, a number of implementation plans have been developed in subsequent years. These additional plans include resource management plans, interpretive plans, and development plans. In total, planning efforts that have been completed since inscription have provided additional structure and a clear management direction for the park. These plans in turn have contributed to a significant enhancement to the integrity and authenticity of Mammoth Cave National Park.

II.4 Management

(See Section 4 of the current Nomination Form and Section 2 and 4 of the original Form)

Management Regime

4a) How can the ownership/management of the property best be described? (Select all that apply.)

- management under protective legislation
- management under contractual agreement(s) between State Party and a third party
- management under traditional protective measures
- other

Please describe.

The United States Government on behalf of the American public owns Mammoth Cave National Park. It is managed by the National Park Service, a federal agency. As a unit of the National Park System, Mammoth Cave National Park receives the highest level of conservation protection afforded by federal law in the United States.

4b) Please indicate under which level of authority the property is managed

National

Please describe

As an entity of the government of the United States of America, the National Park Service is an agency within the Department of the Interior. Mammoth Cave National Park is operated and managed under the authority of national government, which has "exclusive federal jurisdiction" over all lands within the park

4c) Please describe the legal status of the property. For example, is it a national, provincial, or territorial park? A national or provincial historic site?

The site is a national park.

4d) Please provide the full name, address, and phone/fax/e-mail of the agency(ies) directly responsible for the management of the property.

Contact #1

Agency Name: Department of the Interior, National Park Service,

Mammoth Cave National Park
First Name: Ronald
Last Name: Switzer
Address: P.O. Box 7
City: Mammoth Cave
State/Prov: KY
Postal Code: 42259
Telephone: 270-758-2184
Fax: 270-758-2349
Email: ron_switzer@nps.gov

Contact #2

Agency Name: National Park Service
First Name: Fran
Last Name: Mainella
Address: 1849 C Street, N.W.
City: Washington
State/Prov: District of Columbia
Postal Code: 20240
Telephone: 202-208-4621
Fax:
Email: fran_mainella@nps.gov

4e) Please provide a list of key laws and regulations, which govern the protection and management of the cultural and natural resources of the property.

The Antiquities Act of 1906

The National Park Service Organic Act of 1916, as amended

The Clean Air Act of 1970, as amended

The Clean Water Act of 1972, as amended

Public Law 69-283 (44 Stat. 635), May 25, 1926 - An Act to provide for the establishment of Mammoth Cave National Park in the State of Kentucky, and for other purposes

The Wilderness Act of 1964

The National Environmental Policy Act of 1969, as amended

The Endangered Species Act of 1973, as amended

The Archeological Resources Protection Act of 1979, as amended

The National Parks Omnibus Management Act of 1998

The Federal Cave Resources Protection Act of 1988

The Redwood National Park Act of 1988

Code of Federal Regulations - Parks, Forests, and Public Property (CFR 36)

Compendium of Regulations - Mammoth Cave National Park - 2003

The National Park Service Management Policies 2001

The National Historic Preservation Act of 1966, as amended

The Native American Graves Protection and Repatriation Act of 1990

4f) Please describe the administrative and management arrangements that are in place for the property concerned, making special mention of the institutions and organizations that have management authority over the property and the arrangements that are in place for any necessary coordination of their actions. Make special reference, if appropriate, to the role of First Nations in managing the property.

The National Park Service, an agency of the United States Government has full management authority over Mammoth Cave National Park. The Park Superintendent oversees management on a day-to-day basis. The Park Superintendent reports to the Southeast Regional Director, who reports to the NPS Director.

4g) Please also note whether there have been any significant changes in the ownership, legal status, contractual or traditional protective measures, or management regime for the World Heritage Site since the time of inscription.

Since 1981, when Mammoth Cave National Park was inscribed on the World Heritage List, there have been no changes in the park's ownership or legal status.

4h) Is there a management plan for the property?

YES

4h1) If YES, please summarize the plan, indicating if the plan is being implemented and since when, and the URL where the plan can be located, if available. (A copy of the plan should be submitted in December 2004. See Section 8)

By law, general management plans are required for all sites within the National Park System. The General Management Plan for Mammoth Cave National Park was completed in 1983. The purpose of the plan was to set forth a basic management philosophy and provide a long-range framework for management decisions. Accordingly, the following management objective was established for Mammoth Cave National Park:

"The aim of management at Mammoth Cave National Park is to perpetuate the integrity and diversity of geologic features and life systems that are associated with the caves, and the aquatic and terrestrial environments, for these have aesthetic, recreational, educational, and scientific values to man."

More specific management objectives in the plan include: (1) To cooperate with various government bodies and other partners. (2) To ensure long-term perpetuation of the cave system, vegetation, wildlife, and other natural resources. (3) To secure adequate information on the park's historical and archeological resources to facilitate their protection and evaluation of their significance and suitability for listing on the National Register of Historic Places. (4) To ensure that park development is adequate for efficient park administration and essential visitor services. (5) To provide commercial facilities and services necessary for visitor use and enjoyment. (6) To facilitate access to and circulation within the park. (7) To foster public awareness and understanding of the cave environment and its environs. (8) To encourage scientific research and collect data on park resources.

In addition to establishing broad goals for Mammoth Cave National Park and specific management objectives, the General Management Plan also affected a number of key decisions. Chiefly, the General Management Plan determined that visitor use facilities would remain in their existing locations (reversing a decision made with the 1976 Master Plan). The General Management Plan also proposed: (1) reopening the New Entrance cave tour route, (2) relocating the Great Onyx Civilian Job Corps Center from Flint Ridge to the northwest part of the park, and (3) promoting additional recreational use of the Hilly Country on the north side of the park. All of these specific management objectives have since been accomplished.

A copy of the plan will be submitted in December, 2004 as part of this periodic report. The plan is not available on a web site.

4h2) If NO, is a management plan under preparation or is preparation of such a plan foreseen for the future?

Financial Resources

4i) What is the annual operating budget for the property in the current fiscal year? (For sites consisting of more than one property provide the budgets of constituent parts.)

In fiscal year 2004, the Congressionally enacted annual operating budget for Mammoth Cave National Park was \$5,694,000 USD. In addition to its annual operating budget, Mammoth Cave National Park participates in a competitive process to obtain funding for specific project needs. The park also obtains revenue from visitor use fees charged for cave tours and camping sites. In total, the park receives at least \$3,000,000 USD each year from project funding and fee revenue.

Sources of Expertise and Training in Conservation and Management Techniques

4k) Please describe any sources of specialized expertise, training, and services that come from sources off-site (e.g., training centers, museum conservation facilities).

Most Mammoth Cave National Park employees possess a considerable amount of specialized expertise and training which has been acquired off-site, typically from earning advanced University degrees in a variety of specialized areas related to park management and conservation. In addition, employees receive specialized training from the system of National Park Service Training Centers (for specialized training in: interpretation, visitor services, law enforcement, natural and cultural resource management, administration, project management coordination, information management, supervision, safety, etc.)

Specialized expertise is also provided to Mammoth Cave National Park by numerous partner organizations such as:

The Cave Research Foundation provides expertise in surveying and mapping the cave system. To date, the Cave Research Foundation has mapped 365 miles of cave passages. Additionally, CRF performs reconnaissance surveys of new and known cave entrances to inventory and document various natural resources and cultural artifacts.

Western Kentucky University provides assistance with curatorial management of natural and cultural resource artifacts, American chestnut restoration, disturbed land restoration, Green River fish and aquatic invertebrate monitoring, salamander monitoring, avian community surveys, tall grass prairie restoration, Karst Institute courses, and research and science symposia.

The Nature Conservancy provides technical engineering expertise in designing the water release modifications of the Green River Dam, river ecology training, Green River fish and mussel community monitoring, and assistance in designing the Cave and Karst Long Term Ecological Monitoring Program.

Bat Conservation International provides technical expertise with the monitoring of bat hibernation habitat, cave entrance gating, and bat conservation and management training for park personnel.

The Louisville Chapter of the Sierra Club provides specialized expertise in managing the park's exotic plant population, American chestnut restoration, and tall grass prairie restoration.

The Kentucky Native Plant Society provides specialized expertise with the restoration of the Showy Lady Slipper and Yellow Lady Slipper Orchids.

Tennessee Tech University provides technical expertise and assistance with the park's mussel propagation project. This project is currently being developed to propagate critically endangered mussels found in the Green River Basin.

The University of Louisville provides technical assistance with the inventory and monitoring of the endangered Kentucky cave shrimp.

The University of Tennessee provides technical expertise with the restoration of American butternut, American chestnut, and hemlock populations.

The University of Kentucky provides technical assistance with the monitoring of herbaceous plant communities and soil pH's affected by acid deposition

The National Speological Society provides specialized expertise with the Echo River cave restoration project. Annually, NSS contributes several thousand hours of volunteer labor and technical assistance with this project.

The University of Kentucky provides specialized expertise regarding archeology and paleontology. Work includes surveys and inventory of resources as well as providing monitoring services to ensure preservation.

4j) Please provide information about the number of staff working at the World Heritage Site (enter figures).

Full Time: 56 (Value must be a number)
Part Time: 14 (Value must be a number)
Seasonal: 117 (Value must be a number)
Other: 817 (Value must be a number)

Please list the job categories of these staff (e.g., Park Superintendent, Historian, Ecologist, Interpreter, General Works/Maintenance Manager) and describe the specialized skills and expertise of the World Heritage Site's staff members.

Employees at Mammoth Cave National Park are organized within seven divisions, which are headed by the Office of the Superintendent. The following job categories are listed for each office and division, along with their areas of specialized skills and expertise:

Office of the Superintendent - The six employees in this office have skills that include general management of protected areas, intergovernmental and community relations, project management, safety, and program analysis.

Division of External Programs and Media Relations - The five employees have skills that range from volunteer coordination to computer specialists, media relations, publications, and community relations.

Division of Facility Management - The 20+ employees in this division have a range in skills. Positions include foreman, heavy equipment operators, electricians, laborers, welders, carpenters, ferry operators, and engineers.

Division Science and Resource Management - These 25+ employees have a range of skills. Positions include biologists, historians, botanists, curators, cave scientists, air quality specialists, hydrologists, ecologists, geologists.

Division of Interpretation and Visitor Services - These 100+ employees are generally the ones who work directly with the visiting public from day to day. They range from tour guides to education specialists, information specialists, and interpretative specialists.

Division of Law Enforcement and Emergency Services - These 10 employees are the protection rangers for the park. They have skills in law enforcement, resource protection, search and rescue, emergency services.

Division of Fee Management - These 15+ employees collect money from ticket sales from visitors entering the cave or the campground. They have skills in visitor contacts and fee collection.

Division of Administration - These seven employees include personnel specialists, budget officer, purchasing and contracts officers, and warehouse staff.

In addition to National Park Service employees working at Mammoth Cave National Park, there are approximately 817 other people working at the park. These people include volunteers, cooperating association staff, researchers, contractors, incidental business permittees, postal employees, and concession employees.

Visitation

4I) *Are there any visitor statistics for the site?*

YES

4I1) *If YES, please provide the annual visitation for the most recent year it is available, indicating what year that is, a brief summary of the methodology for counting visitors, and briefly describe the trends in visitation. (In describing these trends, please use the year of inscription as a baseline.)*

Mammoth Cave National Park attracted 1,961,388 visitors in 2003. Of this total, 379,645 attended an organized cave tour. In 1981, the park received a total of 1,577,405, with 447,371 attending a cave tour. Thus, in the twenty-two years since inscription, total visitation has increased by 24%, though the number of people attending a cave tour has decreased by 15%.

Visitor statistics for Mammoth Cave National Park are compiled on a monthly basis, then summarized each year. The methodology for compiling visitor use of Mammoth Cave National Park includes an actual head count of cave tour participants, combined with a statistical projection of other visitors throughout the park. The statistical projection involves the use of road counters on each major access route. A formula has been developed to calculate the average number of occupants in each vehicle at each location.

Since Mammoth Cave National Park was designated in 1941, visitation has grown significantly, with two major episodes of peak use. The first major growth period was between 1958 and 1973. During the 15-year period, cave tour visitation increased from 209,538 per year to the park's all-time highest level of 675,167. During the rest of the 1970's, and into the 1980's, cave tour visitation decreased, reaching a low point of 402,385 in 1983. Cave tour visitation increased over the following nine years, peaking at 566,185 in 1992. Between 1993 and 2003, cave tour visitation has decreased every year, ebbing to 379,645 in 2003.

4m) Please briefly describe the visitor facilities at the property.

Visitor facilities include a visitor center, parking areas, hotel, cottages, motel, restaurant, gift and craft shops, publications store, 90 miles of trails for hiking, biking, and horseback riding, 31 miles of river, and tour boat offerings. The park contains a network of roads and trails that provide for visitor access and circulation to most areas in the park. Trails serve hikers, bikers, and horse-back riders. The Green and Nolin Rivers in the park provide boating, canoeing, and fishing opportunities.

4n) Is there tourism/visitor management plan for the property?

YES

4n1) If YES, please briefly summarize the plan, and provide a URL where the plan can be located.

The tourism/visitor management plan for Mammoth Cave National Park is encapsulated in the park's 1983 General Management Plan. The purpose of the General Management Plan is to set forth a basic management philosophy and provide a long-range framework for management decisions.

The tourism and visitor use goals for Mammoth Cave National Park include the following: (1) To make available opportunities for year-round, resource-compatible use of the park. (2) To foster public awareness and understanding of the unique cave environment, surrounding karst topography, indigenous vegetation and wildlife, and prehistoric and historic resources in the park. (3) To offer opportunities for environmental education by school groups and others interested in the cave system and other park resources. (4) To offer opportunities for special populations to enjoy the park resources. (5) To ensure that park development is adequate for efficient park administration and essential visitor services. (6) To provide commercial facilities and services necessary for visitor use and enjoyment. (7) To facilitate access to and circulation within the park. (8) To cooperate with various government bodies and other partners so that public educational and recreational opportunities within the park are fully integrated.

In addition to establishing tourism and visitor use goals for Mammoth Cave National Park, the General Management Plan also affected a number of key decisions. Chiefly, the General Management Plan determined that visitor use facilities would remain in their existing locations (reversing a decision made with the 1976 Master Plan). The General Management Plan also proposed: (1) reopening the New Entrance cave tour route, and (2) promoting additional recreational use of the Hilly Country on the north side of the park.

The framework established in the General Management Plan is further developed with implementation plans. Accordingly, the park is preparing a Long Range Interpretive Plan. This plan will be completed in 2004 and will identify both annual and long-range objectives for achieving the educational and interpretive goals for the park.

A copy of the General Management Plan for Mammoth Cave National Park will be submitted in December 2004 as part of this periodic report. The plan is not available on a web site.

Scientific Studies

4o) Please list key scientific studies and research programs that have been conducted concerning the site. (Please use the year of inscription as a baseline.)

Scientific work has been regularly occurring at Mammoth Cave National Park for decades, both before and after the park was inscribed on the World Heritage List in 1981. Many investigations, both short-term and long, have been carried out on aspects of natural systems in and around Mammoth Cave National Park. Mammoth Cave is considered one of the most-studied cave systems in the world.

There has been a spike in scientific research efforts during the past 10 years. In the early 1990's, the park established a "Science and Resource Management" division within the park's organizational structure. Key specialist positions were established to assist with a variety of scientific studies and research efforts underway at the park.

In recent years, Mammoth Cave National Park has been designated as "prototype" park for the National Park Service's Long Term Ecological Monitoring program. This program has doubled the number of employees working at the park on scientific and research tasks. In addition, Mammoth Cave National Park is the host park for the Cumberland-Piedmont Vital Signs Network, which encompasses 14 national park areas in three states. Finally, the initiation of the two programs mentioned above has been accompanied with a dramatic increase in university research and partnering efforts.

Currently, the baseline phases of Inventory and Monitoring projects are nearing completion on: (1) Cave aquatic communities. (2) Cave entrance ecotone communities. (3) Green River benthic macroinvertebrates. (4) Freshwater mussels. (5) Amphibians. (6) Green River fish. (7) Mercury bio-accumulation in fish and insects. (8) Breeding bird census. (9) Amphibians associated with vernal pools. (10) Terrestrial salamanders. (11) Hibernating bat populations. (12) Cave invertebrates. (13) Woodrats. (14) Kentucky cave shrimp census. (15) Forest Vegetation. Cave Resources Inventory protocols and software have been developed, and a large number of caves in the park have been inventoried in the process.

Groundwater has been intensely studied for years. Groundwater dye tracing, which serves to define groundwater basins, has been completed. Base-line water quality inventories have been done, as well as investigations into the mechanisms of non-point contaminant transport and water quality. The park also operates several continuous-recording digital water monitoring sites which yield data relative to physical and gross chemical characteristics.

In the two decades following inscription, a considerable amount of scientific work has been completed to identify and document the significance of the cultural resources in Mammoth Cave National Park. An Archeological Overview and Assessment was completed in 1993 and identified 1,008 archeological sites. A more extensive archeological survey of three miles of main cave passage has yielded over 10,000 features. The park has seventy-four structures identified within its "List of Classified Structures." Thirty structures are listed on the National Register of Historic Places, including four historic districts. The park museum collection contains over 150,000 objects.

4o1) Please describe how the results of these studies and research programs have been used in managing the World Heritage Site.

A multitude of scientific research has been conducted at Mammoth Cave National Park. The results of studies and research programs have furthered the acquisition of knowledge and, in turn, have resulted in improved management of Mammoth Cave National Park in numerous ways. Some of the results of the most pivotal scientific studies and research programs are highlighted in the following paragraphs:

Water quality data at karst aquifer recharge points has been evaluated to determine the effectiveness of agricultural best management practices in preserving and conserving aquatic resources associated with the World Heritage Site. Toward this end, sinkhole drainage engineering along transportation corridors, agricultural Best Management Practices, sinkhole dump cleanups, and mitigation of parking-lot runoff have also been evaluated to determine their ability to preserve natural resources. Monitoring of water quality through physical, chemical, and biological means has been used to gauge changes in resource conditions. Similarly, for both subterranean and surface aquatic communities, restoration of natural flow patterns has been evaluated in the Green and Nolin Rivers to determine the effectiveness of Green River Dam management decisions. Currently, data is being collected and used to evaluate the potential for removal of Lock and Dam #6, patterning upstream reservoir releases after natural flood pulses, and releasing warm oxygenated water at the Green and Nolin River Dam spillways.

Given that infestation by non-native zebra mussels can be anticipated, acquisition of baseline data on phytoplankton and zooplankton in the rivers has been acquired to gauge the degree of impact and any possible recovery.

Although much information has been gathered on water flow and base-line water quality, we are now beginning to understand and focus efforts on what remains to be accomplished. Base line monitoring must continue in order to chart water quality with respect to changing land-use within the park's watershed. Water quality data is being evaluated and correlated with the aquatic community monitoring data and changes in land-use to determine at what point early degradation of aquatic communities occur and what land-uses have the highest impact to water quality. Topical water quality monitoring is being conducted to target specific land-uses. For example, over the past decade an increase in oil exploration within the World Heritage Site watershed has occurred. A monitoring program specifically designed to determine impacts to aquatic resources relative to oil exploration has been initiated.

Work efforts have been initiated taken toward ecological restoration of the Natural Entrance Ecotone of Mammoth Cave, and collected data is being analyzed to determine the effectiveness of this management decision. USFWS approved bat gates have been installed at the entrances of Bat, Colossal, Wilson, Mammoth, Long and Dixon caves as a result of study investigations, installation of a low impact artificial cave trail with lint curbs has also been implemented as a result of scientific studies. Evaluation of scientific data has resulted in the removal of calcium chloride impregnated trail sediments, as well as site restoration of habitat for the endangered Kentucky cave shrimp. Scientific data has also been utilized to make decisions about the cave relighting project to minimize graffiti and algae growth, and lint and graffiti mitigation. As the inventory of park caves continues, cave gates will be installed--as required--to insure resource protection.

The identification and documentation of the incredible array of cultural resources within Mammoth Cave National Park further illustrates the extent of the universal values that exist at the park. Increasing efforts to document and preserve cultural resources has led to a greater understanding and appreciation of their importance. Management efforts have been oriented to preserve and manage both natural and cultural resources.

4o2) What role, if any, has the property's designation as a World Heritage Site played in the design of these scientific studies and research programs? For example, has there been a specific effort in these programs to focus on the recognized World Heritage values of the property?

The designation of Mammoth Cave National Park as a World Heritage Site has always played an integral role in the design and implementation of scientific studies and research programs. Specifically, the World Heritage Site resource values strongly influenced the park's Cave and Karst Long Term Ecological Monitoring program's design and selection of vital sign (ecological) indicators that are/will be monitored as indicators of ecosystem health and integrity. Additionally, World Heritage Site resource attributes and values were considered in designing the park's water quality and air quality monitoring programs and are frequently cited in grant proposals as funding justifications.

Education, Information and Awareness Building

4p) Is there a plaque at the property indicating that it is a designated World Heritage Site?

YES

4q) Is the World Heritage Convention logo used on all of the publications for the property?

NO

4r) Are there educational programs concerning the property's World Heritage values aimed at schools?

YES

4r1) If YES, please briefly describe these programs.

Between 350 and 400 programs are offered annually (both on-site and off-site) concerning the geology of the Mammoth Cave karst region and the park's role as sanctuary for both flora and fauna communities. Between 15,000 and 20,000 local area students are contacted annually through these programs. Three to six teacher in-service workshops are conducted annually to encourage local schools to use park resources as an outdoor classroom. Teacher activity guides have been produced and are distributed to local teachers and schools providing hands on activities for in-class preparation on park resources and themes. Seven "General Agreements" have been signed between the park and local schools integrating the park's educational outreach programs into the program of studies for all grade levels.

In addition to formal education programming, each year thousands of school children participate in cave tours offered to the general public. When large groups accompany these tours, whenever possible the group is separated and given individual attention to ensure the students understanding of the park's significance.

4s) Are there special events and exhibitions concerning the property's World Heritage values?

YES

4s1) If YES, please briefly describe them.

For the past six years the "Springfest Weekend" has been conducted at the park celebrating and interpreting the natural resources of the park. Special programming included guest speakers on bird life, wildflowers, fire management, and karst geology. An art show is held in conjunction with the Springfest Weekend focusing of the park's surface landscape and karst features.

4t) Please briefly describe the facilities, visitor center, site museum, trails, guides and information material that are available to visitors to the World Heritage Site.

Mammoth Cave National Park contains a visitor center which serves as the primary public contact point, as well as the origination point/staging location for all cave tours. The park offers eleven different cave tours throughout the year, as well as a variety of surface walks and nature programs. The park provides most visitors with a park brochure and activity guide. Additionally, a non-profit cooperating association, "Eastern National", provides an extensive number of publications, maps, and interpretive information on Mammoth Cave National Park.

4u) What role, if any, has the property's designation as a World Heritage Site played with respect to the education, information and awareness building activities described above? For example, has the World Heritage designation been used as a marketing, promotional, or educational tool?

Mammoth Cave National Park's designation as a World Heritage Site contributes to public education, information, and awareness. The park displays a World Heritage Site plaque, and this premier status is cited within most park publications and on the main entrance signs. Additionally, park employees educate visitors on the meaning of World Heritage Site status. Despite these efforts, public knowledge and awareness of the World Heritage status for Mammoth Cave National remains low. There is great potential for additional marketing and promotional efforts to enhance public awareness of Mammoth Cave National Park's designation as a World Heritage Site.

II.5 Factors Affecting the Property
(See Section 5 of the current Nomination Form)

5) Please briefly identify factors affecting the property under the following headings: Development Pressures, Environmental Pressures, Natural Disasters and Preparedness, Visitor and Tourism Pressures, Number of Inhabitants Within Property and Buffer Zone and Other - major factors likely to affect the World Heritage values of the property. First discuss those that were identified in the original nomination, in the same order in which they were presented there, then those that have been discussed in reports to the World Heritage Committee since inscription, and then other identified factors.

This section should provide information on all the factors which are likely to affect a property. It should also relate those threats to measures taken to deal with them, whether by application of the protection described in Section 4e or otherwise.

Not all of the factors suggested in this section are appropriate for all properties. The list provided is indicative and is intended to assist the State Party in identifying the factors that are relevant to each specific property.

(In describing these trends, please use the year of inscription as a baseline.)

*For EACH Factor, please specify the following:
key actions taken to address factor
any plans that have been prepared to deal with factor in the future
whether the impacts of factor appears to be increasing or decreasing, and
the timeframe for which the comparison is being made.*

Development Pressures

5a) Provide information about Development Pressures on the following: demolitions or rebuilding; the adaptation of existing buildings for new uses which would harm their authenticity or integrity; habitat modification or destruction following encroaching agriculture, forestry or grazing, or through poorly managed tourism or other uses; inappropriate or unsustainable natural resource exploitation; damage caused by mining; and the introduction of invasive nonnative species likely to disrupt natural ecological processes, creating new centers of population on or near properties so as to harm them or their settings.

Adverse Impact of Lock and Dam #6

The continued presence of Lock and Dam #6 is the single greatest unresolved ecosystem management issue for Mammoth Cave National Park. The Green River, and its tributary Nolin River, flow 25 and 7 miles (40 and 11 km) respectively through the park. These base-level streams possess one of the most diverse fish (82 species) and invertebrate faunas (51 species of mussels) in North America. Normal flow of 16 miles (26 km) of the Green River and all of the Nolin River within the park is retarded by Lock and Dam #6, a relict navigation dam located just beyond the downstream park boundary. Habitats for 11 aquatic species federally listed as endangered or special concern are seriously degraded through reduction of natural flow velocity and resultant siltation. As a result, some of the world heritage values identified in the original nomination have been adversely affected.

For over 50 years, Mammoth Cave National Park has strongly advocated for the removal of Lock and Dam #6. There is a long history of park management efforts associated with Lock and Dam #6, which to date has been unsuccessful. In the original nomination, mention was made of the endangered status of several species of freshwater mussels as well of the special concerns with the status of Kentucky Cave Shrimp. However, at the time of inscription, there was no direct mention of the relationship between Lock and Dam #6 and the decline of fresh water mussels and Kentucky Cave Shrimp. As a result of scientific studies in the past two decades, much has been learned about river ecology and cave ecology. Additional scientific studies are continuing, and the park will continue to advocate for the removal of Lock and Dam #6.

Adverse Impacts from the Introduction of Exotic Species

The introduction of exotic species continues to have an adverse impact on the diverse forest and plant communities within Mammoth Cave National Park. There are two categories of exotic species which have had significant impact on park forests: pathogens and invasive plants. Chestnut Blight and Dutch Elm Disease have virtually eliminated American Chestnut and American Elm, and a similar fungal disease is currently impacting Butternut. An emerging concern relates to the likely presence of the debilitating disease, Dogwood anthracnose. Invasive exotic plant species such as honeysuckle, garlic mustard, kudzu, microstegium, silver poplar, and ailanthus out-compete native species and are therefore spreading. With over 1000 species of native flowering plants (including 84 tree species), the potential for loss of biodiversity is great.

The original nomination provides extensive documentation and emphasis on the importance of maintaining biological diversity, both in the cave and in the surface estate. According to the Technical Review report: "outside the cave, the karst topography is superb, with fascinating landscapes, luxuriant vegetation, and abundant wildlife." Much knowledge and concern about the invasion of exotic species has only been understood in the past decade, so this concern was not specifically identified in the original nomination. In response to this threat, Mammoth Cave National Park has conducted additional scientific research to document the presence and range of exotic species within park boundaries. In addition, the park has obtained project funding to initiate efforts to reduce the presence of exotic species, though much additional work needs to be done.

Environmental Pressures

5b) Environmental pressures can affect all types of property. Air pollution can have a serious effect on stone buildings and monuments as well as on fauna and flora. Desertification can lead to erosion by sand and wind. What is needed in this section is an indication of those pressures which are presenting a current threat to the property, or may do so in the future, rather than a historical account of such pressures in the past.

Adverse Impacts on Water Quality from External Sources

The Mammoth Cave karst aquifer owes the majority of its recharge to areas outside the park boundary. Of particular interest are large portions of the upper Green River watershed and the park's groundwater basins on adjacent lands to the northeast, east, and south of the park's boundary. Activities conducted in these areas greatly influence water quality within the park. Population growth and general-use development continues to increase in cities and unincorporated areas around Mammoth Cave National Park. The primary activities that influence the park's water quality include: disposal of domestic, municipal and industrial sewage, solid waste disposal, agricultural and forestry management practices, oil and gas exploration and production, urban land-use, and recreational activities. These practices could--and in some cases are believed to--be causing adverse impacts to park resources.

The aquatic and terrestrial cave ecosystems in the park are largely intact, but are vulnerable to increasing human activity within and beyond park boundaries. Mammoth Cave water quality is threatened mainly by pollution that originates outside of the park such as toxic spills, agricultural pesticides, and animal wastes. Accidental spills of toxic chemicals have occurred with regularity along Interstate 65, the Cumberland Parkway, and the CSX Railroad.

Flow through the Mammoth Cave karst aquifer can be very rapid, on the order of thousands to tens-of-thousands of feet per day. Contaminants entering the karst aquifer can thus be rapidly transported, unaltered through the conduit system. The karst aquifer is very dynamic--it responds nearly instantaneously to rainfall. Aquifer stage can rise 10's of feet in a matter of hours (there are numerous records showing stage rises of over 100 feet over the course of one day). Also, chemical and bacteriological properties of the groundwater can change dramatically following rainfall events. These stage rises can activate high-level overflow routes between groundwater basins and thus direct flow in different directions depending upon aquifer conditions.

The site's original nomination stated: "Of major concern is the Sinkhole Plain to the south and east of the park. Precipitation that falls on this extensive area collects in underground streams, flows through natural conduits in limestone beneath the park, and finally discharges into the Green River. Even minor changes in quality or quantity of water could adversely affect the unique aquatic life in underground streams and alter natural cave development."

To respond to the potential adverse effects of water quality, Mammoth Cave National Park continues to implement a comprehensive water quality monitoring program. In addition, the following initiatives have been implemented to enhance water quality. First, special attention has been provided to the recharge area for the park, which was designated as a Biosphere Reserve in 1990. One of the outcomes of this designation was the implementation of a best-management practices program for agricultural operations. Second, a complete map of sinkhole locations has been prepared for areas along the nearby interstate highway. With this map, trained personnel can more effectively respond to spills of hazardous materials. Third, water quality in the Green River Watershed will greatly benefit from the Green River Conservation Reserve Enhancement Project, which began implementation in 2001. Finally, the park has recently installed a stormwater management system to protect the cave system from run-off and impurities associated with visitor parking areas.

Adverse Impacts on Air Quality from External Sources

Air quality at Mammoth Cave has been determined to be the worst of any national park area in the United States. Air pollution is having a serious adverse effect on rainfall pH, which in turn alters soil pH and leaches soil nutrients such as potassium, calcium, and magnesium from the soil matrix. The loss of these critical plant macro-nutrients may be altering plant succession to the benefit of exotic species. Additionally, the park receives approximately 42 pounds per acre of nitrogen deposition, through precipitation, from nearby coal burning energy utilities, which may be artificially enhancing nitrogen levels in soils and thereby deleteriously affecting plant community composition, growth rates, and the abundance of exotic plants. Recently conducted mercury bio-accumulation research reveals that mercury contamination is impacting fish at the apex of the food chain. In 1999, atmospheric ozone levels reduced the growth of some trees such as black cherry and tulip poplar by 20% and 40% respectively.

The impact of poor air quality at Mammoth Cave National Park adversely affects park resources throughout the park, including those with World Heritage values. Specific World Heritage values include the diverse flora and fauna in the park (criteria iv). The original nomination provides extensive documentation on the diverse ecological system at Mammoth Cave National Park. The existence of poor air quality is not mentioned specifically because sophisticated scientific measurements and monitoring of air quality has only been conducted in the past 10 years. The original nomination did mention threats of pollution and water quality, though specific mention was not made to the air-quality related pollution concerns, such as the accumulation of mercury and the impacts of acid deposition.

Mammoth Cave was also inscribed under criteria i and criteria iii. The World Heritage values under these criteria may also be affected by poor air quality, and the resulting acid deposition of the ecological systems in and around Mammoth Cave. While further research is needed, it is possible that the lower pH within rain water is altering the natural geological processes of cave development and formation.

Significant adverse impacts of air pollution have only recently been documented. In response, the park has responded in several ways. First, the park continues with additional scientific research and monitoring as part of the ongoing comprehensive air quality monitoring program. Second, in addition to the park's air quality station, the National Oceanic and Atmospheric Administration is in the process of installing a global climate change weather station in the park. Third, when ozone levels in the park reach hazardous levels, ozone advisories are provided to park visitors and park employees. Fourth, park staff monitor and have an affirmative responsibility to provide comments on any proposed new source of air pollution. Finally, all park vehicles have been converted to run on alternative fuels.

Natural Disasters and Preparedness

5c) This section should indicate those disasters which present a foreseeable threat to the property and what steps have been taken to draw up contingency plans for dealing with them, whether by physical protection measures or staff training. (In considering physical measures for the protection of monuments and buildings it is important to respect the integrity of the construction.)

Natural disasters that have occurred at Mammoth Cave National Park in the past include earthquakes, tornados, floods, or snow and ice storms. These events generally have a negligible impact on the park's cave system and the inter-related natural resources. Damage from natural disasters is mainly sustained to infrastructure within the park (i.e. damage buildings, road closures, etc.). Damage can also occur to natural resources. For example, ice storms can take down or weaken thousands of trees within Mammoth Cave National Park, which in turn contributes to a build-up of fuels that could pose an increased fire hazard. Natural disasters can cause damage and negative impacts, but are not considered a major threat to World Heritage Site values at Mammoth Cave National Park.

Visitor and Tourism Pressures

5d) In completing this section what is required is an indication of whether the property can absorb the current or likely number of visitors without adverse effects (i.e., its carrying capacity). An indication should also be given of the steps taken to manage visitors and tourists. Possible impacts from visitation that could be considered include the following:

- i. damage by wear on stone, timber, grass or other ground surfaces ;*
- ii. damage by increases in heat or humidity levels;*
- iii. damage by disturbance to the habitat of living or growing things; and*
- iv. damage by the disruption of traditional cultures or ways of life.*

Visitor use into the cave system at Mammoth Cave National Park is strictly controlled. Visitors are provided access only through guided tours, and only 12 miles of Mammoth Cave have been designated as tour routes.

Cave tour visitation in 2003 was 379,645 (the lowest level of visitor use in almost 40 years). Mammoth Cave National Park has the capacity to absorb additional visitors without any adverse effects on its World Heritage values.

Number of Inhabitants Within Property and Buffer Zone

5e) Include the best available statistics or estimate of the number of inhabitants, if any, within the property and any buffer zone and describe any activities they undertake which affect the property.

Two Mammoth Cave National Park employees and their families have been authorized to live in the park as permanent, year-round inhabitants. Many other people (e.g. temporary staff, volunteers, and visitors) make overnight stays within Mammoth Cave National Park. The park has 12 apartment/dorm units for temporary employees, a house for volunteers, 42 hotel rooms, 20 lodge rooms, 10 deluxe cottages, 21 woodland cottages, and 140+ camping sites. During the year, there can be as many as several hundred inhabitants in Mammoth Cave National Park on any given night. These inhabitants do not have an adverse impact on the World Heritage values at Mammoth Cave National Park.

Mammoth Cave National Park contains 52,830 acres and is located adjacent to Edmonson, Barren, and Hart Counties. The hydrological recharge area for Mammoth Cave National Park extends outside of park boundaries and encompasses large portions of these three counties. In 2002, the total population for Edmonson, Hart, and Barren Counties was 63,996 people. The interaction zone for the Mammoth Cave Area Biosphere Reserve contains 909,328 acres and includes Edmonson, Hart, Barren, Metcalf, Butler, and Warren Counties. In 2002, the total population for these six counties was 161,924.

The existence of thousands of people living in the surrounding communities of Mammoth Cave National Park presents a continuing need to ensure environmental protection along with sustained growth and development. The surrounding population is expected to continue to grow in the coming decades. It is important that population growth and development occur in ways that are sustainable and compatible with the regional environment, including the world heritage resources at Mammoth Cave National Park. The park will continue to support implementation of the Biosphere Reserve program, for which a major goal is to achieve human growth and development while preserving the environmental quality of the core resource values.

5f) List Other Factors

N/A

II.6 Monitoring **(See Section 6 of the current Nomination Form)**

Administrative Arrangements for Monitoring Property

6a) Is there a formal monitoring program established for the site? In this case, "monitoring" means the repeated and systematic observation and collection of data on one or more defined factors or variables over a period of time.

YES

6a1) If YES, please describe the monitoring program, indicating what factors or variables are being monitored and which partners, if any, are or will be involved in the program.

The National Park Service is laying the groundwork nationally for a systematic approach to developing region-specific integrated natural resource monitoring programs. Regional networks within the entire national park system are charged with defining the purpose and scope of the monitoring program; compiling and summarizing existing data to better understanding park ecosystems; developing conceptual models of relevant ecosystem components; selecting "vital signs" (ecological indicators) and specific monitoring objectives for each; and determining appropriate sampling design and sampling protocols.

Mammoth Cave National Park has been selected as an early and pivotal participant within the nationwide ecological monitoring program. The park's Cave and Karst Long-term Ecological Monitoring (LTEM) program is one of 11 prototype monitoring programs in the National Park Service (NPS) selected through competition in the early 1990s which received full funding in fiscal year 2001. The Mammoth Cave National Park LTEM program was selected as a prototype park unit to develop and test methods for ecological monitoring in other parks with cave and karst resources. The purpose of the LTEM program is to provide park resource managers with the information necessary to accomplish the NPS mission of conserving park resources "unimpaired." National Park Service policy (NPS Management Policies 2001) requires that park managers know the nature and condition of the natural resources under their stewardship, understand the forces driving the changes, and have the means to detect and document changes in those resources.

The LTEM program will monitor park natural resources to: 1) determine status and track trends in selected attributes as indicators of the condition of park ecosystems, 2) provide early warning of abnormal changes in conditions of selected resources, 3) provide data to better understand the dynamic nature and function of park ecosystems, 4) provide data to meet legal mandates related to natural resource protection and visitor enjoyment, 5) provide science-based information to support the park resource management decision-making process, and 6) understand the consequences of the park's management on the natural resources. In order to meet these objectives, the LTEM program will develop and implement long-term monitoring protocols for several resources (e.g., surface and subsurface water, cave river fauna, cave crickets, cave air, specific vegetation communities, mussels, bats, etc

The goals of the LTEM program are to detect, predict, and understand changes in major resources of primary interest to the park. The philosophical focus and orientation is on understanding and detecting trends in the park's three major ecosystems through multiple-parameter monitoring of functional pathways that serve as conduits or connections between, and among, those systems.

The LTEM program focuses on the relevance of monitoring to meet the needs and goals of management actions directed at sustaining the quality or integrity of the parks ecosystems and reducing or eliminating threats from natural or human causes. Problems may be predicted when particular measures of change (i.e. trends) exceed acceptable bounds (defined by natural or historic limits and/or standards set by policy guidelines). The role of monitoring is crucial in detecting meaningful levels of change. This monitoring program aspires to obtain an understanding of cause-and-effect relationships, and utilizes a contemporary strategy which incorporates threat-specific monitoring along with effects-oriented monitoring.

Enhanced, high-sensitivity air quality monitoring instrumentation was installed at the park air quality station in March 1995. This enhanced instrumentation measures ambient concentrations of ozone, sulfur dioxide, carbon monoxide, nitrogen oxide, and reacted oxides of nitrogen. The added instrumentation gives the park the capability to assess both anthropogenic and biogenic air pollution sources. From 1983 to 1995, the park only had the capability to assess the resulting pollutant, ozone. Instrumentation gives the park the ability to measure the needed precursors that cause ozone formation. The air quality station also continuously measures wind direction, wind speed, temperature, dew point, relative humidity, solar radiation, and barometric pressure. Meteorological measurements, combined with pollutant measurements, allow for needed performing mathematical modeling of impacts on park natural and cultural resources. Volatile organic compound (VOC) measurements were made for the first time (summer 1995) to assess the contribution of natural (i.e. biogenic) pollution sources.

The air quality station also has instrumentation to measure visibility conditions, in terms of kilometers of visual range. Additional measurements are made to determine fine particles that reduce or impair park visibility and measure dry deposition on park resources. The park is also performing wet deposition measurements in the acid precipitation program.

The installation of enhanced air quality monitoring instrumentation in 1995 is part of a three-year research program to assess the transport of air pollution from Nashville and Middle Tennessee. The instrumentation is on loan from the Tennessee Valley Authority for the duration of the assessment period. Under provisions of the Clean Air Act, the park is classified as a Class I area--one of only 48 areas in the National Park System with this classification. To adequately address impacts of industrial growth within the park's air shed, it is critical that these parameters be measured on a long-term basis. Additionally, measurements of volatile organic compounds have been collected to document natural emissions on a long-term basis. The park has established an air quality related biological monitoring program to document impairment of park biotic resources from anthropogenic pollution. Optical measurements, that have documented changes in visual range, have been made and utilized to predict additional potential impacts from recently proposed utility generators.

In September of 2003, the park worked with the Natural Resource Conservation Service to install a continuous soil-monitoring station linked to the internet. This allows for the scientific study of soil temperature, conductivity, soil moisture, and solar radiation trends. Additionally, in July of 2003, a Green River monitoring station was installed to determine the trends of river water levels, pH, temperature, conductivity, turbidity, and dissolved oxygen levels and trends. In October of 2003 the park will be cooperating with the National Oceanic and Atmospheric Administration to install a global climate change monitoring station that will provide data about global climate change trends and conditions.

Key Indicators for Measuring State of Conservation

6b) At the time of inscription of the property on the World Heritage list, or while in the process of reviewing the status of the property at subsequent meetings, have the World Heritage Committee and the State Party identified and agreed upon key indicators for monitoring the state of conservation of the property's World Heritage values?

NO

6b1) If YES, please list and describe these key indicators, provide up-to-date data with respect to each of them, and also indicate actions taken by the State Party in response to each indicator.

N/A

6b2) If NO key indicators were identified by the World Heritage Committee and used so far, please indicate whether the World Heritage Site management authority is developing or plans to develop key indicators for monitoring the state of conservation of the property's World Heritage Values.

As part of the Longterm Ecological Monitoring Program, key indicators for monitoring the state of conservation of the World Heritage Values at Mammoth Cave National Park have been identified. They are described in detail in the response to Question 6a1, above.

Results of Previous Reporting Exercises

6c) Please describe briefly the current status of actions the State Party has taken in response to recommendations from the World Heritage Committee at the time of inscription or afterwards, through the process known as "reactive reporting." (Note: The answer to this question will be "not applicable" for many sites.)

Since being inscribed in 1981, Mammoth Cave National Park has had to respond to one instance of "reactive reporting." In 2002, the World Heritage Committee formally requested a report from the National Park Service on a proposal to build an industrial park approximately eight miles from the boundary of Mammoth Cave National Park. The World Heritage Committee wanted to know whether this proposed industrial park would pose a threat to the integrity of Mammoth Cave National Park's World Heritage values. The Committee expressed concerns, encouraged additional research, and asked to be kept informed on the project in the future. In response, the Superintendent of Mammoth Cave National Park provided information on the proposed industrial park and cooperative efforts that have been underway to significantly minimize or eliminate any potential threat. In 2003, the World Heritage Committee staff determined that there was no longer any need for additional reactive reporting on this matter.

II.7 Conclusions

World Heritage Values

7a) Please summarize the main conclusions regarding the state of the World Heritage values of the property (see items II.2. and II.3. above).

Mammoth Cave National Park was nominated as a World Heritage Site on the basis of the criteria i, iii, and iv for natural properties. The nomination form for Mammoth Cave National Park provides extensive information and documentation on how the criteria were satisfied. In 1981, Mammoth Cave National Park was inscribed as a World Heritage Site. The nomination form for the park was fully accepted without any modification or amendment by the World Heritage Committee. Though a nominated site only had to satisfy one of the criteria, Mammoth Cave National Park satisfied three of the four natural criteria.

As of 2004, the validity of the three criteria documented in the nomination form for Mammoth Cave National Park remains intact. In the past 23 years, an extensive amount of scientific research has been performed at Mammoth Cave National Park. Also, an additional 140 miles (225 km) of cave passage has been discovered and mapped since 1981, including 80 miles (129 km) of cave passage outside the boundaries of Mammoth Cave National Park. Consequently, the justification for Mammoth Cave National Park designation as a World Heritage Site is even stronger than it was at the time of inscription.

The 1981 nomination for Mammoth Cave National Park did not include a statement of significance. With this periodic report, a proposed statement of significance is included, and this statement will be submitted to the World Heritage Committee for a decision on its acceptance. The proposed statement of significance describes the tremendous importance of Mammoth Cave National Park and the many universal values that exist at the property.

In section II.3 of this report, a summary of the authenticity and integrity of Mammoth Cave National Park is provided. This summary includes a synopsis of the documentation provided in the original nomination and from the IUCN Technical Review. Mammoth Cave National Park continues to strongly support the seven "conditions of integrity" cited within clause 44b of the operational guidelines for implementation of the World Heritage Convention.

The integrity and authenticity of Mammoth Cave National Park has been bolstered as a result of three significant changes that have occurred since Mammoth Cave National Park was inscribed in 1981. The changes include the establishment of the Mammoth Cave Area Biosphere Reserve in 1990, the discovery and mapping of 140 additional miles (225 km) of cave passageways over the past 22 years, and the approval of an updated General Management Plan in 1983. Each of these developments has added to Mammoth Cave National Park's high level of authenticity and integrity.

Another conclusion of this periodic report, in regard to World Heritage values at Mammoth Cave National Park, is to identify the obvious lack of consideration of its world class cultural resources, which were not fully understood or documented at the time of inscription. It is noteworthy to point out that the significance of Mammoth Cave National Park is strongly supported by both world class natural and cultural values inherent in the property. While the World Heritage Site nomination only considered natural values in the justification section, outstanding universal values of the cultural resources at Mammoth Cave National Park were described at great length in the property description section. Likewise, the technical review reports make specific reference to the special importance of the cultural resources at Mammoth Cave. It is unclear why the nomination did not propose inscription for Mammoth Cave National Park on the basis of both natural and cultural resource values that exist at the property since the universal importance and significance of the natural and cultural values have been interwoven for over 4,000 years.

Potentially, cultural resources at Mammoth Cave National Park may satisfy cultural criteria iii and iv. Properties under criteria iii should: "bear a unique or at least exceptional testimony to a cultural tradition or to a civilization...which has disappeared." Within many miles of Mammoth Cave, there is extensive evidence of Native American use of the Cave. Native Americans penetrated as far as three miles into the cave passages where they chipped gypsum and mirabilite from the walls. The stable atmosphere in the caves has preserved perishable items that are non-existent elsewhere. In particular, the archeological record preserved in Mammoth Cave has contributed significantly to understanding about the domestication of plants and the development of agriculture in the Eastern Woodlands.

In addition, properties under criteria iv should: "be an outstanding example of a type of...technological ensemble...which illustrates a significant stage in human history." The Salt Petre Works within Mammoth Cave National Park may satisfy this criteria. Salt Petre works were used during the war of 1812 to manufacture an important ingredient used in the creation of gunpowder. These nationally significant cultural resources are a remarkably intact example of early 19th century technology. The Historic American Engineering Record Report of 1986 says, "[The] Mammoth Cave Saltpeter Works represent the most complete example known of the equipment used in the processing of cave saltpeter, a major component of gunpowder during the War of 1812."

It is understood that the United States is limited to forwarding only one new or renomination each year to the World Heritage Committee. Nonetheless, this periodic report concludes that the world class cultural resources at Mammoth Cave National Park should be considered for inscription in the future.

Management and Factors Affecting Site

7b) Please summarize the main conclusions regarding the management of and factors affecting the property (see items II.4. and II.5. above).

Mammoth Cave National Park continues to sustain strong institutional and structural support. The park, which is owned by the United States of America and operated by the National Park Service, has strong legislative protection. Mammoth Cave National Park benefits from having a comprehensive General Management Plan and an operating budget of \$5,694,000 USD (in fiscal year 2004). The management of the park is greatly enhanced with a strong and devoted work force that includes 187 National Park Service employees (in fiscal year 2003). Many of these employees are from the regional area and have dedicated their entire professional careers to Mammoth Cave National Park. An additional 817 people assist the park each year as volunteers, concession employees, cooperators, contractors, and researchers. The park also benefits from specialized conservation expertise provided by numerous cooperators, volunteers, and researchers. With approximately 2 million visitors each year, there continues to be a high level of public interest and support for Mammoth Cave National Park. A component of the the park's General Management Plan is devoted to promoting tourism and visitor management objectives for the park.

Mammoth Cave National Park is considered the most researched cave system in the world. Scientific research has been regularly occurring at Mammoth Cave National Park for decades. A surge of research activity has taken place in the past decade with the establishment of the park's Science and Resource Management Division in the early 1990s and the establishment of the Long Term Ecological Monitoring program in 2001. The results of scientific work at Mammoth Cave National Park has resulted in improved management, particularly in the area of air quality, water quality, and endangered species management. New research efforts have recently been initiated to gather information on the paleontological and microbial resources in Mammoth Cave National Park. A number of significant ecological restoration projects have been successfully completed.

Public educational programs are regularly conducted at Mammoth Cave National Park. Park visitors are afforded tremendous learning opportunities by participating in a cave tour. Mammoth Cave National Park also coordinates a regional environmental education program, and special events highlight the park's universal values.

Some of the World Heritage values at Mammoth Cave National Park have suffered from adverse impacts from developmental and environmental pressures. One of the major resource impacts to the park is the continued existence of a relict navigational dam on the Green River; this dam affects the normal flow of 16 miles of the Green River into the cave system, as well as seven miles of the Nolin River. Habitat for 11 aquatic species, which are federally listed as Endangered or Special Concern, is seriously degraded as a result of the reduction of natural flow velocity.

Another adverse impact to Mammoth Cave National Park involves the transport of pollution or other wastes that travel through the hydrological system. Because large portions of the upper Green River watershed and the groundwater basins affecting Mammoth Cave National Park lie outside park boundaries, activities conducted in these areas greatly influence water quality within the park. While the aquatic and terrestrial cave ecosystems within Mammoth Cave National Park are largely intact, they remain vulnerable to pollution entering the hydrological system beyond park boundaries.

Air pollution continues to have serious adverse effects on visibility as well as other environmental conditions in the park. Rainfall pH is much lower than normal, and the impact of "acid rain" is not yet fully understood. Nearby coal burning power plants appear to be a major contributor to air pollution in Mammoth Cave National Park, including alarming levels of mercury in fish and other species.

Pathogens and invasive plants have also produced adverse effects. Chesnut blight and Dutch Elm Disease have virtually eliminated American Chesnut and American Elm trees, respectively. Left unchecked, invasive exotic plant species such as oriental honeysuckle, garlic mustard, and kudzu have the potential to outcompete native species in the park.

Various management actions have been undertaken to monitor and ameliorate the above mentioned issues affecting the World Heritage values at Mammoth Cave National Park.

In contrast to development and environmental pressures, natural disasters may only result in minor impacts to the world heritage site values at Mammoth Cave National Park. Similarly, visitor use within the park's cave system is strictly controlled. Mammoth Cave National Park may have the capacity to absorb additional visitors without any adverse effects.

Proposed Future Action(s)

7c) Please describe briefly future actions that the State Party has approved to ensure the conservation of the World Heritage values of the property.

These sample headings can be used as a checklist.

- Modification of legal or administrative structure*
- Changes to financial arrangements*
- Increases to staffing level*
- Provision of training*
- Modification of visitor facilities*
- Preparation of a visitor management plan*
- Studies of public knowledge of the World Heritage Site*
- Emergency preparedness*
- Establishment or improvement of a monitoring program.*

Mammoth Cave National Park continues to implement a management program to preserve World Heritage values at the site. The park continuously works to protect and maintain the park's natural and cultural resources while providing for public enjoyment and appreciation.

In 2003, Mammoth Cave National Park completed a business plan which documented a need for 75 additional full-time employees, at a cost of \$4.7 million USD. The plan identified strategies for increasing revenues and cutting costs. While implementation of the recommendations in the plan will achieve cost efficiencies, a much higher appropriation from the U.S. Congress will be needed to close the 38% gap between required and existing resources.

Because labor costs have increased significantly in recent years, overall staffing levels at Mammoth Cave National Park are expected to remain stable or decline slightly. Staffing levels for positions funded by base operating funds will likely decrease. Staffing levels for positions funded by other funding sources will likely increase.

Mammoth Cave National Park is in the process of implementing a \$40 million USD construction program. Major construction projects include: rehabilitation of the Visitor Center; re-paving of two roads; installation of a stormwater management system; replacement of the cave lighting system; replacement of Mammoth Dome Tower; installation of a new trail system; and replacement of the park water system. Completion of these projects will result in a major upgrade and modernization of infrastructure at Mammoth Cave National Park.

It is already known that there is a low level of public knowledge and awareness of Mammoth Cave National Park's World Heritage Site status. A greater level of effort will be undertaken to increase park knowledge and awareness of the park's designation as a World Heritage Site.

Responsible Implementing Agency(ies)

7d) Please identify the agency(ies) responsible for implementation of these actions described in 7c, if different from those listed in Section II.4.

Responsible Implementing Agency #1

Entity Department of the Interior, National Park Service,
Mammoth Cave National Park
First Name: Ronald
Last Name: Switzer
Address: P.O. Box 7
City: Mammoth Cave
State/Prov: KY
Postal Code: 42259
Telephone: 270-758-2183
Fax: 270-758-2349
Email: ron_switzer@nps.gov

Timeframe for Implementation

7e) *If known, or predictable, please provide a timeline for the implementation of the actions described in 7c.*

The timeline for implementation of many of the actions described in 7c will be during the following five years. By 2010, Mammoth Cave National Park will have completed most construction projects associated with improving visitor facilities and other infrastructure. The Long Range Interpretive Plan will have been completed and implemented. The Long Range Monitoring Program will have been established and underway at Mammoth Cave National Park and applied to many other park areas with cave and karst resources.

Needs for International Assistance

7f) *Is it anticipated that International Assistance, through the World Heritage Fund, will be requested for any of the planned actions described above?*

NO

7f1) *If YES, please state the nature of the request and when it will be requested, if known.*

N/A

Potential Decisions for the World Heritage Committee

7g) *Please indicate if the World Heritage Site management authority has preliminarily identified, as a result of this reporting exercise, an apparent need to seek a World Heritage Committee decision to change any of the following:*

(Note: Following completion of the Periodic Report exercise, the State Party, in consultation with appropriate authorities, will determine whether to proceed with seeking a Committee decision on these changes. To request such changes, the State Party will need to follow a separate, formal process, subsequent to submitting the report.)

- change to criteria for inscription
- change to Statement of Significance
- proposed new Statement of Significance, where previously missing
- change boundaries or buffer zone

II.8 Documentation

(See Section 7 of the current Nomination Form and Section 3 of the original Nomination Form)

8a) Please review the original nomination for the property to determine whether it is necessary or advisable to supply, update or amend any of the following documentation for the World Heritage Site. Indicate what documentation will be supplied to supplement the information found in this report. (This documentation should be supplied at the time the Periodic Report is submitted to the World Heritage Centre, in December 2004.)

- a) Photographs, slides and, where available, film. This material should be accompanied by a duly signed authorization granting, free of charge to UNESCO, the non-exclusive right for the legal term of copyright to reproduce and use it in accordance with the terms of the authorization attached.
- b) Topographic or other map or site plan which locates the WHS and its boundaries, showing scale, orientation, projection, datum, site name, date and graticule.
- c) A copy of the property management plan.
- d) A Bibliography consisting of references to all the main published sources on the World Heritage Site, compiled to international standards.

8b) Do you have a digital map of the WHS, showing its location and boundaries?

NO

8bi) If yes, in what format(s) is the map?

N/A

8bii) Is it published on a publicly-accessible website?

NO

8biii) If yes, please provide the URL of the site where the map can be found. Must be a valid URL.

N/A